

ABSTRACT

OF

The Proceedings of the Forty-second Annual Meeting of the Association of Life Insurance Medical Directors of America

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VOL. XVIII

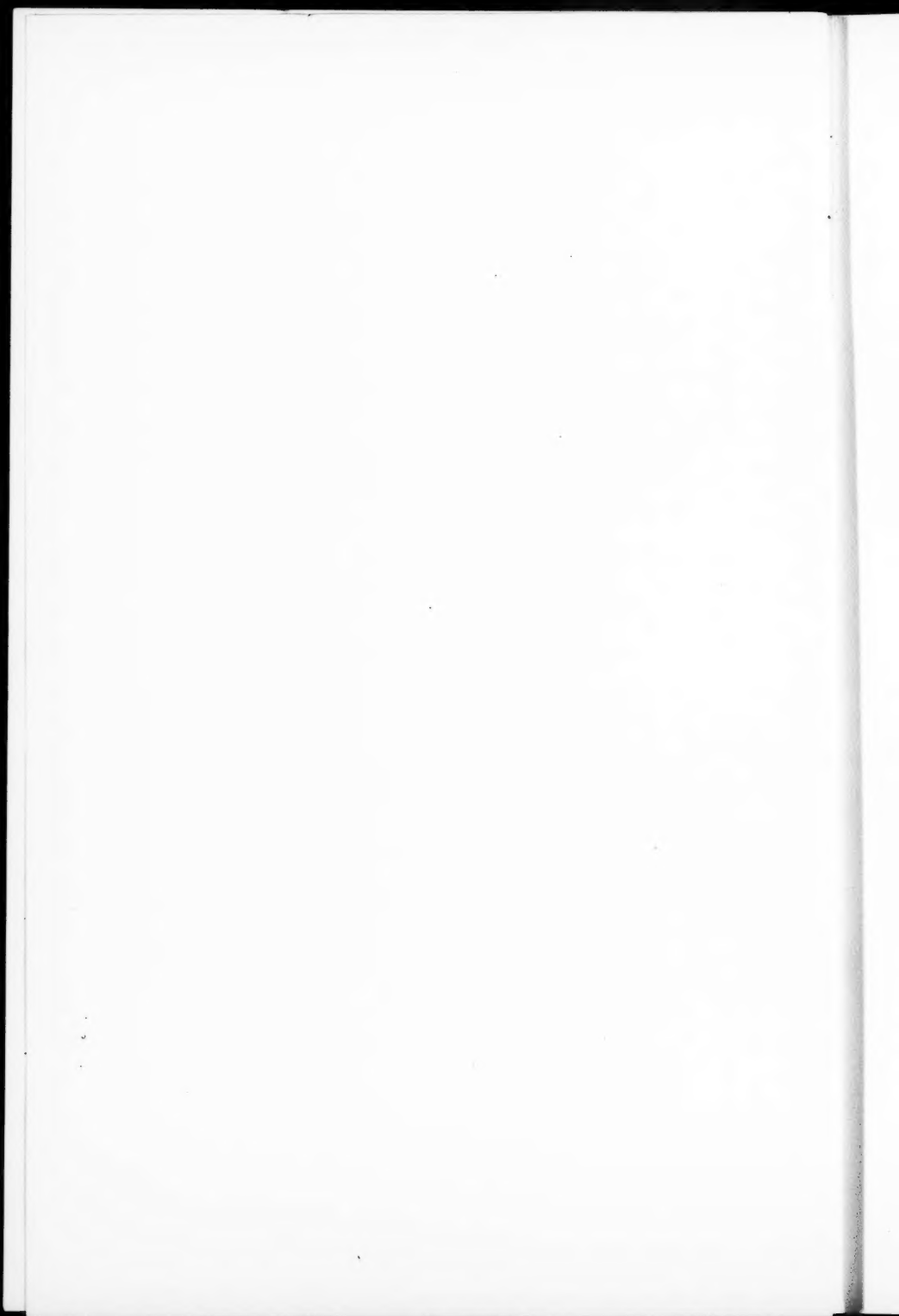
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MEDICAL DIRECTORS OF AMERICA

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An Abstract of the Proceedings
OF THE
Association of
Life Insurance Medical Directors
of America

FORTY-SECOND ANNUAL MEETING

The Forty-second Annual Meeting of the Association of Life Insurance Medical Directors of America was held at the Hunt Memorial Building of the Hartford Medical Society, Hartford, Conn., on October 22 and 23, 1931. The Association was the guest of the Phoenix Mutual Life Insurance Company. President Robert L. Rowley was in the chair.

The following members, delegates and guests were present at some time during the sessions: Drs. G. E. Allen, H. B. Anderson, R. B. Andrews, W. B. Aten, A. E. Awde, H. A. Baker, N. J. Barker, W. B. Bartlett, J. T. J. Battle, M. B. Bender, E. B. Bigelow, C. C. Birchard, D. N. Blakely, N. R. Blatherwick, J. T. Bowman, W. M. Bradshaw, C. T. Brown, H. B. Brown, B. J. Byrd, J. T. Cabaniss, E. J. Campbell, F. A. Causey, L. D. Chapin, C. L. Christiernin, C. P. Clark, Henry Colt, E. A. Colton, H. W. Cook, P. M. Cort, D. B. Cragin, Jennings Crawford, H. C. Cruikshank, George Cullen, R. M. Daley, H. D. Delamere, E. J. Dewees, E. G. Dewis, W. E. Dickerman, W. W. Dinsmore, P. G. Drake, C. R. Dudley, O. M. Eakins, W. G. Exton, H. H. Fellows, Otto Folin, R. A. Fraser, H. M. Frost, R. A. Goodell, R. J. Graves, F. L. Grosvenor, J. B. Hall, Llewellyn Hall, W. F. Hamilton, G. A.

Harlow, Frank Harnden, W. L. Hilliard, Ross Huston, W. G. Hutchinson, P. H. Ingalls, C. B. Irwin, W. A. Jaquith, A. O. Jimenis, A. E. Johann, G. E. Kanouse, A. S. Knight, M. M. Lairy, J. M. Livingston, A. A. MacDonald, L. F. MacKenzie, C. N. McCloud, C. B. McCulloch, A. J. McGanity, W. T. McNaughton, W. F. Milroy, J. T. Montgomery, R. C. Montgomery, H. O. Mosenthal, J. B. Nichols, Herbert Old, M. I. Olsen, J. A. Patton, G. P. Paul, W. O. Pauli, J. S. Phelps, C. B. Piper, J. E. Pollard, F. P. Righter, A. J. Robinson, T. H. Rockwell, E. K. Root, Gordon Ross, R. L. Rowley, C. L. Rudasill, S. C. Rumford, E. F. Russell, H. C. Scadding, G. L. Schadt, S. B. Scholz, Jr., G. H. Shaw, J. T. Sheridan, J. L. Siner, Dewitt Smith, J. M. Smith, W. B. Smith, Morton Snow, R. S. Starr, A. R. Stone, E. V. Sweet, H. F. Taylor, W. E. Thornton, J. P. Turner, H. E. Ungerleider, Euen Van Kleeck, F. S. Weisse, F. L. Wells, P. V. Wells, C. D. Wheeler, P. D. White, T. H. Willard, Gordon Wilson, G. E. Woodford, and Messrs. Arthur Hunter, John Larus, Samuel Milligan and Archibald Welch.

Total attendance at all sessions, 125.

The following persons were admitted to membership:

- Dr. Robert E. Andrews, Massachusetts Mutual Life Insurance Company, Springfield, Mass.
- Dr. Howard B. Brown, Massachusetts Mutual Life Insurance Company, Springfield, Mass.
- Dr. Robert A. Goodell, Phoenix Mutual Life Insurance Company, Hartford, Conn.
- Dr. Alfred H. Griess, Columbian National Life Insurance Company, Boston, Mass.
- Dr. Albert S. Irving, Prudential Insurance Company, Newark, N. J.
- Dr. Walter T. McNaughton, The Old Line Life Insurance Company of America, Milwaukee, Wis.
- Dr. Alvin E. Murphy, Prudential Insurance Company, Newark, N. J.

Memorial to Dr. Adams

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Dr. John B. Nichols, Acacia Mutual Life Association, Washington, D. C.

Dr. Gordon Ross, Massachusetts Mutual Life Insurance Company, Springfield, Mass.

Member Emeritus:

Dr. William E. H. Wehner, Fidelity Mutual Life Insurance Company, Philadelphia, Pa.

Dr. ROWLEY—During the past year our Association has lost four members by death. Suitable testimonials to their memory have been prepared by representatives of the Association and will appear in our published records.

JOHN LINCOLN ADAMS

Dr. John Lincoln Adams, Assistant Medical Director of the Metropolitan Life Insurance Company, and a member of this Association since 1916, died suddenly at his home in Madison, N. J., on Saturday, April 4, 1931. Dr. Adams was born in Morris County, N. J., near Dover, on May 8, 1861, and in 1889 he married Miss Ella Downing of Louisville.

After attending Williams College, Dr. Adams entered the College of Physicians and Surgeons, Columbia University, and was graduated May 12, 1885 (Harson Medalist). He became district physician for the Board of Health of Newark, N. J., in 1886, and visiting physician at St. Barnabas' Hospital, in charge of obstetrics. He began his career in insurance medicine as medical examiner for the Prudential Insurance Company of America, and later as Southern Medical Supervisor for the Prudential at Louisville, Ky. In September, 1890, after the Sun Life Insurance Company of Louisville, Ky., was founded, Dr. Adams and his father became associated with that Company. Dr. Adams became Medical Director of the Sun Life of Louisville, and later Secretary, holding the latter position up to the time the Company was assumed by the Metropolitan Life Insurance Company in December, 1902. In February, 1903, he joined

the staff of the Metropolitan Life and served for some time in the field. In May, 1908, he returned to the Home Office Medical Division and in December, 1916, was appointed Assistant Medical Director.

Under his supervision, medical work in connection with Industrial insurance was rearranged. He prepared a table of impairments and ratings that simplified the classification of risks and made it so clear and concise that it became possible to delegate most of this work to lay clerks. In the Ordinary Department, his judgment was always sought and it seldom failed to clarify doubtful cases. An important man to the Company, he held the confidence of the Medical Division and by his energy and industry made a place for himself that will be difficult to fill.

Dr. Adams had made his home at Madison, N. J., since 1920 and took an active part in community work. At the time of his death he was President of the Madison Board of Health, a member of the American Public Health Association, a member of the Madison Presbyterian Church, the Orange Camera Club and of the Morris County Mosquito Extermination Commission. He was a Mason and while in Louisville served as District Deputy Grand Master, presided over all the bodies of the York-Rite and closed his Masonic career as Commander of De Molay Commandery, Knights Templar.

Although in the latter years of his life his activities had been somewhat restricted due to failing health, his manner remained vigorous and energetic, his opinions logical and valuable. We shall miss Dr. Adams and his memory will always be held in affectionate esteem.

EDWIN WELLES DWIGHT, M. D.

Dr. Edwin Welles Dwight, Medical Director of the New England Mutual Life Insurance Company, died at his home in Marshfield, Massachusetts, January 14, 1931.

He was born in Auburn, New York, August 11, 1863, the son of Henry Williams and Mary Jane (Winslow) Dwight. His

boyhood was spent in Pittsfield, Massachusetts. He graduated from the Harvard Medical School in 1891, served as surgical house officer in the Boston City Hospital and afterwards as assistant superintendent. On leaving the Hospital he began private practice in Boston. In the years that followed he was assistant visiting surgeon to the Boston City Hospital, instructor in surgery and in legal medicine in the Harvard Medical School, professor of legal medicine in Tufts College Medical School, one of the commissioners of public institutions of the City of Boston, also surgeon of the National Express Company and Chief Surgeon of the Boston & Maine and Boston & Albany Railways. He compiled and published a brief textbook on "Medical Jurisprudence" in 1903 and one on "Toxicology" in 1904.

In 1897 he became an examiner of the New England Mutual Life Insurance Company, in 1902 Assistant Medical Director and, on the death of Dr. John Homans in 1903, Medical Director. He was elected a member of this Association in 1903 and during the following twenty-four years he failed to be present at the annual meeting only twice. In the last four years of his life ill-health alone prevented his attendance. Not only was he present at the meetings but he took an active part in discussions and from time to time presented papers of interest and importance. In 1910 he was elected a member of the Executive Committee, which later became the Executive Council, and was re-elected annually thereafter.

Soon after he became Medical Director, realizing that the basis of medical selection, as then practised, was unscientific and unsatisfactory, he began a comprehensive study of the mortality experience of his own Company. The facts of actual experience and the technique of investigation which he learned from this study made him enthusiastic and eager to help, later on, in the work of studying the combined experience of forty-three companies.

At the eighteenth annual meeting of the Association in 1907 there was a discussion of a "co-operative investigation" and Dr.

Dwight was appointed chairman of a committee to study impaired lives. As chairman he reported progress at the 1908 meeting. By the time of the next annual meeting, in 1909, this Association had joined forces with the Actuarial Society and a "collective investigation" had been begun by a joint committee of the two organizations. This became the well-known Medico-Actuarial Mortality Investigation, the scope of which and the value of which are too well known to members of the Association to make extended comment necessary. It is not inappropriate, however, to pause and pay tribute, occasionally, to the pioneers for their vision and courage which, fortunately, was combined with good judgment and painstaking industry in the undertaking which had such far-reaching consequences.

At the annual meeting in 1905, Dr. Dwight read a paper entitled "The Significance of Albumin and Casts when found in the Urines of Apparently Healthy Applicants for Life Insurance". The conclusions of this paper were based on careful examination of material found in the medical journals of all languages, for the period of the preceding thirty years, which were on file in the Surgeon General's office in Washington. His conviction that an applicant, satisfactory in other respects, but who showed on examination, or who had shown previously, albumin or casts or both, could be accepted as a standard risk—provided an expert chemist's analysis of a concentrated specimen showed normal proportions of solids and no pathological elements on either chemical or microscopic examination, marked a definite forward step in handling a problem which had troubled and perplexed many medical directors.

The increasing and compelling need of more satisfactory tests for discovering early signs of circulatory impairments led, under his inspiration, to the development, by one of his associates, of the Cardio-Respiratory Test which is designed to aid in estimating the reserve strength of the circulation. This test is now in its tenth year of practical application in our Company. It has not yet fully emerged from the experimental stage but it has shown that, while in certain types of impairment it gives

little or no aid, in other types it is both helpful and dependable.

He did not fail to appreciate the very great value of statistical studies but he also recognized some of their limitations. Besides the facts of actual experience, questions of physiological function are involved and call for specific, individual study.

Before the Cardio-Respiratory Test was fully developed, Dr. Dwight had turned his attention to another puzzling problem, how to determine the acceptability, or non-acceptability, of an applicant with glycosuria or one who had shown glycosuria in the past. He persuaded another associate to make an exhaustive study of the questions involved and to recommend a test which would be dependable, reasonably available and not too expensive. The test adopted calls for one determination of the percentage of blood-sugar made exactly two hours after a measured amount of glucose has been taken by mouth. Our Company has relied solely upon the results of this test, in all cases of glycosuria, for over eight years, and the mortality experience has been very satisfactory.

In 1926 a 200-page book entitled "Life Insurance Medicine, a Study of Some of its Problems and Their Relation to Clinical Medicine" was published. This book contained eight articles, written by Dr. Dwight and four of his associates, as a contribution to the rapidly growing literature of life insurance medicine. It received cordial recognition from sister companies and from the insurance press.

Dr. Dwight was a man of many interests and had a keen zest in meeting life's problems. When in active practice, he was an enthusiastic and resourceful surgeon, bold, yet conservative. When he became a medical director, he was equally enthusiastic in studying the principles and practices of life insurance medicine, and to the last day of his life he never lost interest in their fascinating perplexities and possibilities. He was fond of the great out-of-doors. He was particularly devoted to shrubs and flowers. He was a friend to all kinds of birds and animals, wild and domesticated. Poultry shows and dog shows always attracted him and at these he served as judge

many times. He had a personality which attracted many friends who, as individuals, represented very varied types. Whatever their social position or occupation, whatever special occasion or "accident" brought them together, the friendship, once established, was permanent. To be able to render, quietly but effectively, assistance or guidance of an unusual nature, made necessary by extraordinary conditions, gave deep satisfaction. Only closest friends knew this trait of his character. He was a strong man, of broad vision, with much of the spirit of the pioneer, to whom a difficult task was a challenge, who was generous in giving encouragement and assistance to fellow-workers, and unfailing loyalty and devotion to his friends, those friends who, in remembering his life, feel greater joy that it has been lived than sorrow that it has ended.

DR. PAUL FITZGERALD, A. B.

Since the last meeting of this Association, death has again entered the ranks of the Prudential Medical Department and taken one of our number in a tragic way.

Dr. FitzGerald while standing on a safety-isle in Broad Street, Newark, on his way to visit a friend who was leaving for the West, was struck by a trolley-car and sustained a fracture of his skull, from which he died two hours later in the Newark City Hospital.

His ancestors, some of whom were actively engaged on the American side of the Revolutionary War, were descended from a fine old Irish family and originally emigrated to this country in the Seventeenth Century. A son of the late Bishop James N. FitzGerald, of the Methodist Episcopal Church, and Mary E. Annin, he was born December 17, 1868, about two blocks from the place where he was struck down. In June, 1896, he married Miss Grace Dashiell. Two sons and two daughters, with their mother, are felt to mourn his passing.

He attended the Public Schools in Newark, later entered Centenary Collegiate Institute at Hackettstown, New Jersey, from which he graduated in 1887, and then went to Syracuse

Memorial to Drs. FitzGerald and Munn 9

University, where he obtained his B. A. degree, Magna Cum Laude, in 1891, being second in his class. Later he was elected to the Phi Beta Kappa Fraternity. In the same year he entered the College of Physicians and Surgeons and graduated in 1894, after which he took an internship in St. Barnabas Hospital, Newark, from which he resigned after six months in order to take an extended trip abroad. Upon his return he began and continued in general practice for eight years, during which time he was appointed as an examiner for The Prudential. In 1903 he discontinued practice to become a member of the Home Office Medical Staff of this Company. In 1919 he was appointed an Assistant, and in 1920 was elected an Associate Medical Director. In May, 1928, he took charge of the medical work connected with the Intermediate and Industrial Branches of this Company, and organized it with exceptional efficiency and success.

The Doctor was a highly educated man, of sound judgment and a rapid thinker, whose opinion and advice were frequently sought and always freely given. He was a kind and loving father, and an ardent Churchman of unswerving faith. He passed to his eternal reward after a life well spent in deeds of helpfulness, kindness and charity, loved, honored and respected, a high-minded American citizen, an honorable gentleman whose home life was an inspiration and blessing to those privileged to know it. He has gone leaving a large circle of friends who sincerely grieve that so exemplary a citizen and friend has entered "that bourne from which no traveler returns".

DR. JOHN PIXLEY MUNN

Died August 15, 1931, in his eighty-fourth year.

Doctor Munn was one of the group of Medical Directors called together by Doctor Keating of the Penn Mutual in May, 1889, to plan an association to promote a more intimate acquaintance and greater co-operation between the Medical Departments of Life Insurance Companies and was one of the committee appointed at the meeting to organize the Association of Medical Directors.

Doctor Munn was born on a farm in the town of Gates, N. Y., near Rochester. His father, Doctor Edwin G. Munn, was one of the first in this country to specialize in diseases of the eye. He practised in Rochester and lived on the farm. His death while Doctor Munn was still an infant, left the management of the farm and the bringing up of the boy to his wife, a woman of unusual ability and strength of character. She lived on the farm and continued its management until her death in her 101st year. Doctor Munn attributed his success to her training and advice. Until her death he was deeply devoted to her.

He graduated from the University of Rochester in 1870 and received his M. D. from Bellevue Hospital Medical College in 1876. In 1877 he was appointed Assistant Medical Director of the United States Life Insurance Company. He became Medical Director in 1883 and President of the Company in 1902 but continued to act as Senior Medical Director. In 1924 he resigned the Presidency and became Chairman of the Board of Directors, which position he filled until his death.

He was a man of many interests. Education, the church, the Y. M. C. A. as well as finance and business attracted him. For many years he was chairman of the Board of Trustees of the University of Rochester and member of the Council of New York University. The development of athletics in the latter school owed much to his interest and activity. In the Y. M. C. A. he held chairmanships in several committees and was especially interested in their rail-road men's department.

Doctor Munn's interest in commercial affairs led to directorships and executive positions in a number of banks and corporations and gave him a wide acquaintance and a host of friends who will not quickly forget him. But he will be longest remembered for his kindness of heart and by those who had experienced his sympathy and helpfulness in time of trouble.

DR. ROWLEY—Next in order is the report of the Nominating Committee.

Report of Nominating Committee

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The Secretary read the following report:

"The Nominating Committee of the Association of Life Insurance Medical Directors begs leave to report that at a meeting regularly held on October 14, 1931, the following nominations were suggested:

For President—Dr. Charles L. Christiernin.

For First Vice-President—Dr. Lawrence G. Sykes.

For Second Vice-President—Dr. H. Crawford Scadding.

For Secretary—Dr. Edwin G. Dewis.

For Treasurer—Dr. Albert O. Jimenis.

For Editor of Proceedings—Dr. Robert A. Fraser.

For Elective Members of the Executive Council—Dr. Morton Snow, Dr. Eugene F. Russell, Dr. Ross Huston, Dr. Chester T. Brown and Dr. Samuel B. Scholz, Jr.

All of which is respectfully submitted.

ROBERT M. DALEY,
CHESTER T. BROWN,
ANGIER B. HOBBS,
WILLIAM R. WARD,
CHESTER F. S. WHITNEY,
THOMAS H. WILLARD, Chairman."

DR. ROWLEY—You have heard the report of the Committee. The officers' election will be tomorrow morning and if there are no other nominations, motion to close the nominations and instruct the Secretary to cast the ballot for the list as nominated by the Committee will be in order.

No further nominations being presented, it was moved, seconded and carried that the nominations be closed, and that the Secretary be instructed to cast the vote for the ticket as nominated.

DR. ROWLEY—I want to call upon Mr. Welch, who is here, to give us a word of greeting. Many of the important contributions to the literature of the Medical Directors Association

have been made by actuaries or actuaries in collaboration with medical directors. A number of years ago, following the completion of the work of the Medico-Actuarial Joint Committee, our Association had the wisdom and foresight to bring into our fold a select few of the actuaries who were associated in that work. One of those is now President of the Phoenix Mutual Life Insurance Company, and I have the honor to call upon President Welch to express to you a few words of greeting. President Welch.

PRESIDENT WELCH—It is a great pleasure to be able to say Fellow Members of The Association of Life Insurance Medical Directors. Dr. Hunter over there and only three others in the Actuarial group have that honor and I can assure you that it is deeply appreciated by us all.

I also feel very much honored that we have you here today in the City of your President because your President is our Medical Director and the honor which you have conferred upon him is shared by his company.

There are five good sized life insurance companies in this city. I know they will all welcome an opportunity to do something for your pleasure while you are here. There are five offices that would be wide open for your inspection if you have time and there are any number of officials in there who would gladly give their time to you if in any way they could make your stay here happier.

It is with a great deal of pleasure that Hartford welcomes you here and you can see how we feel about it by the weather that we have provided for you on this your first day.

DR. ROWLEY—Some lives are characterized by greatness; others have great moments. For me this occasion is one of much importance, and I feel it is both a pleasure and a privilege to have the opportunity to open this meeting—the 42nd Annual Meeting of The Association of Life Insurance Medical Directors.

Our Association stands for the advancement of knowledge in insurance medicine to the purpose of applying that knowledge in

medical underwriting. As individuals our task is by no means an easy one. I feel certain that no one will take issue with me in the statement that our work is becoming more and more complex and difficult, with the additions constantly made to our fund of information in the field of diagnosis and more especially in the field of prognosis.

As in every form of human endeavor and achievement, with each step forward on the road of progress, there opens before us new vistas and greater opportunities in which to apply our best efforts.

That our Association has a right to be proud of its accomplishments there can be no denial, and yet our pride must be tinged with a spirit of humility when we contemplate the vastness of the work that lies ahead of us.

This is hardly the time or the place for me to make any extended remarks.

The program provided for today and tomorrow should furnish sufficient mental pabulum to satisfy most of us, and to tax the digestive capacities of many of us. I want to take this opportunity to express my personal gratitude to those who have prepared papers and discussions for this meeting. The time and work so generously contributed by them will measure the success of our meeting.

I want also to express my appreciation and gratitude to the medical staffs of the Hartford companies for their splendid work under the leadership of my good friend, Dr. Cragin, in planning and carrying to completion all the details of the arrangements for this meeting.

Personally, I am much pleased that the Association is this year holding its meeting in Hartford. We have tried to provide for your comfort and your pleasure while you are with us.

If we don't succeed, I hope you will let us know.

FACTORS CONCERNED IN RECOGNIZING
CARDIAC ENLARGEMENT

BY DR. GORDON WILSON, MEDICAL DIRECTOR,
Maryland Life Insurance Company.

The Visibility of the Apex Beat.

Our President, Dr. Rowley, has asked me to present a paper on some phase of circulatory disease, and as I am essentially a clinician, I have picked as my subject "Cardiac Enlargement and its Recognition", since it is one of the most important signs of cardiac disease.

The importance of cardiac disease as a cause of death is well shown by the crude death rate of "Diseases of the Heart and Blood Vessels", which has increased from 186 per 100,000 in 1910 to 235 in 1928, and on a separate sheet I have shown the deaths at different age periods, beginning at 30, from "Angina Pectoris," "Other Diseases of the Heart", and "Other Diseases of the Arteries", for white males in the United States registration area in 1928, and it is of interest that it is in the second group, "Other Diseases of the Heart", that there is the greatest increase in the number of deaths as age advances, and it is in this group that cardiac enlargement is most frequently found.

Actual, or potential, cardiac disease in an individual can only be recognized, or at least the diagnosis suggested, through one, or more, of the following factors.

The first, and perhaps the most important to the clinician, is the history of past diseases, and the mild symptoms, such as moderate dyspnoea or indigestion, and this history, as a rule, is with difficulty obtained by the clinician, and rarely, if ever, obtained by the insurance examiner. We are, of course, familiar with Stephen Mackenzie's figures that 71 per cent. of children who have had one attack of Rheumatic Fever, or Chorea, are found at later periods to have the definite signs of valvular dis-

case of the heart, and, as it has been pointed out frequently, in the other 29 per cent., while there may be no sign of valvular defect, yet undoubtedly there has taken place myocardial damage, which brings about a definite, though much delayed, mortality. One has only to mention Angina Pectoris to know that its diagnosis depends almost entirely upon symptomatology.

The second diagnostic aid in the recognition of circulatory disease is the pulse, not only as to regularity and tension, but also as to rate, and the percentage of tachycardias due to thyroid disease is not as small as one would think, and of course the thyroid disease that gives rise to tachycardia practically always gives rise to myocardial changes, and generally these myocardial changes are the immediate cause of death.

The third diagnostic suggestion is an abnormality of the heart sounds, either in the character of the sound, its intensity, or its replacement to a greater or less degree by a murmur, but time has proved the wisdom of the specialists who advised the Surgeon General of the U. S. Army at the beginning of our entrance into the World War, that murmurs, at least systolic, could be ignored unless they were accompanied by *definite cardiac enlargement*, and in instructions given to the special boards for cardiovascular examinations, the greatest stress was laid on the size of the heart as to whether or not the soldier should be accepted for full military duty, where there was a systolic murmur.

The fourth and last clinical aid in the recognition of cardiac disease is cardiac enlargement, and its presence alone always justifies a diagnosis of cardiac damage, and the clinical methods used to detect such enlargement are inspection, palpation and percussion. There is hardly a text-book that fails to mention the importance of noting where the apex beat is located, and lays stress on the fact that if it is external to the mid-clavicular line, there is cardiac enlargement or displacement, but few of the books state how infrequently one can see the apex beat.

About a year and a half ago, in a diagnostic clinic, where I was one of the consultants in diseases of the heart and lungs, I began the practice of stating definitely whether the apex beat was visible

or not, and I made it a rule that the patient should sit facing the light, and with my back to it, and in each case to look carefully for pulsations in the apical region. Much to my surprise, in only one case out of four, was I able to see the apex beat, and on attached sheets I have classified the examinations I made of 147 while males, varying in age from 30 to 50, and most of them in the period 35 to 45, according to whether they were underweight, normal weight or overweight, and also according to whether there was present any gross disease of the lungs, or any abnormality of the heart or circulation, and I might add that every one of these patients had a "6 ft." film, and no diagnosis of cardiac hypertrophy was made unless the film showed enlargement, and such enlargement was confirmed by percussion made at the end of full inspiration, since it was frequently noted that in stout individuals, especially those of good abdominal musculature, the breadth of cardiac dullness was frequently two fingers breadth less at the end of deep inspiration than during ordinary respiration.

In a separate table I have noted the cases that had circulatory disease or dysfunction, and in this group 13 did *not* have visible pulsation at the apex, while 6 did have an apical pulsation that could be seen. I would, however, call attention to the fact that in the group where the apex pulsation was not visible there was only one case of cardiac hypertrophy, and the lack of visibility of the apex beat could be well accounted for since this patient had emphysema and was overweight.

Personally, I believe that the most accurate method of detecting cardiac enlargement is by light percussion, and in the hands of the expert, it is equal in accuracy to the orthodiascope, and more accurate than the "6 ft." film. A good example in proof of the last statement is the case of a friend of mine who was seen in consultation by Dr. William S. Thayer. This man was below the average in height, stocky, definitely but not markedly overweight, and had abdominal muscles of unusually good tone. Prior to his seeing Dr. Thayer, I had a "6 ft." film made of his heart by an excellent roentgenologist, who always endeavored to make the exposure at the end of deep inspiration. In this case the heart shadow

was more than 50 per cent. of the chest diameter, and apparently was definitely enlarged to the left. Dr. Thayer mapped out accurately the cardiac dullness by percussion, and measured it, percussion being done at the end of full inspiration, and according to Dr. Thayer's figures there was absolutely no enlargement. In view of the conflicting evidence as to cardiac enlargement, we immediately put him in front of a fluoroscope and measured the cardiac shadow at the end of full inspiration, and found the heart to be absolutely the same in measurement as Dr. Thayer had noted on percussion, and definitely smaller than was shown by the "6 ft." film.

The percussion method of noting the size of the heart while accurate in skilled hands is unfortunately very inaccurate in the hands of the average physician or medical student, and from many years' experience as a teacher, and as a consultant, I have found that relatively few physicians are capable of obtaining accurate information by percussion in the study of the heart, and more especially in the study of the lungs, and their inability to obtain this information is due to three factors, first, the failure in teaching them proper technique, second, the infrequency with which they percuss the chest, and finally, an ear that is not sufficiently sensitive to tones, or at least kept so by frequent use.

By far the most accurate and easy method of recognizing cardiac enlargement by the average physician, and with little training, is the fluoroscope, and with it one can measure accurately the breadth of the heart shadow, the breadth of the aortic shadow, and total chest diameter, and with these figures have a permanent record of the size of the heart, and I believe that the time is not far distant when an orthodiascope, or a fluoroscope will be just as an essential part of the equipment of the medical examining room in a general agency of a large city, as is the scales today.

Insurance experience has shown us that in the last thirty years there has been a very definite improvement in the mortality of the age groups 15 to 29 years, and 30 to 44, but in the third group, age 45 and over, there has been very little improvement, and it is in this latter group that the percentage of deaths from circulatory

disease is highest, and it is my opinion that it is in this group that we have failed in our recognizing circulatory diseases, and the chief failure has been in not recognizing enlargement of the heart. Another insurance experience is that there is a very definitely higher mortality rate for the policy-holders of large amounts, even though they are more frequently examined and not infrequently examined by more than one examiner, and very probably one of the factors in this higher mortality rate is due to the fact that large policies are generally issued only to men in the older age group, as they alone have the means to meet the high premiums, or are of such value to their business that business insurance is sought to protect the Company in which they are an important factor of success.

Granting that the insurance experience noted above is true, and that a probable factor, and, a most important one, is that circulatory disease causes some of the high relative mortality, how then can we improve our means of detecting such impairment? It has been my experience as a consultant in general practice, and as a consultant to a diagnostic clinic, that an extremely high percentage of cases of circulatory disease that have not been diagnosed previously by physicians are diagnosed by the consultant by the ordinary methods used at the bed-side, *but used with skill*, and only a very small percentage are recognized by laboratory methods alone, designating as laboratory the use of the X-ray, and of the electrocardiograph. If then, my experience is correct, it seems to me that what is needed is greater skill on the part of the examiner, and you cannot expect to hire the skill of the consultant at the rate of \$5.00 a case, but I do believe that you can hire such skill at \$10.00 or \$15.00 a case, provided that the examinations be made, in a measure, at the examiner's convenience, and that the examinations be made only in the consultant's office or in a properly equipped office of the insurance company. I also believe that, if such medical examiner be fairly well known in a community as a consultant, very rarely would there be objection made by the applicant to the conditions noted above. One company that I know of has adopted the plan of paying their chief

examiner \$10.00 for every examination made by him, and definitely requires that he be used in cases designated by the Home Office, and if this policy were followed by other companies, to the extent that he alone should examine applicants where the amount applied for was \$20,000.00 or more, and age was above 40, we would have in the future a far better mortality in this group, and the probable cost of such increased fee would be far more than offset through the savings in the mortality rate, especially so, since the average policy issued is for less than \$2,500.00, which would mean that the percentage of cases examined by such a chief examiner would be small in view of the total number of examinations. Of course, such appointment of chief, or special, examiner would only apply to centers of large population, but it is in these centers that large policies are written, and perhaps the time will come, if such a plan as I have outlined above is tried out and found satisfactory, that there may be joint action by the insurance companies in appointing such special examiner with the result that when a number of policies of large amount are applied for at the same time, by the same applicant, a single examination can be made by the special examiner for all the companies, and it could be arranged that, in view of the large fee that he was receiving from the companies, he would, in such cases, have made at his own expense a "6 ft." film and electrocardiogram, and, if he thought it advisable, or was instructed, he could have such special blood studies made as would be required, and also a basal metabolic rate estimation.

Twenty-five years ago our problem was Tuberculosis, that justly held the title that John Bunyan gave, "The Captain of the Men of Death", and the death rate for that disease at that time was above 200, while today it is below 90. Today, however, we have two Captains that have succeeded him, one "Cancer" that cannot be recognized or even suspected five years before death, and the other Captain is "Heart Disease", with a death rate of 207.8, but unlike cancer this "Captain of the Men of Death" can be recognized many years before it kills, if we concentrate our means of detecting it in the age group where it is most frequently found.

MORTALITY STATISTICS

U. S. Registration Areas

Table A

Death White Males, 1928

	Age 30-34	Age 50-54	Age 60-64	Age 65-69	Age
"Angina Pectoris"	235	1,172	1,980	1,732	
"Other Diseases of Heart"	1,024	6,327	11,082	14,005	15,331*
"Other Diseases of Arteries"	19	329	882	1,459	2,330**

*Age 70-74.

**Age 75-79.

Table B

CRUDE DEATH RATE PER 100,000

	Year 1910	Year 1920	Year 1928
Diseases of the Heart	158.8	159.4	207.8
Diseases of the Heart and Blood Vessels.....	186	188	235

Table C

POPULATION OF REGISTRATION AREA

Year 1910	Year 1920	Year 1928
53,831,742	87,486,713	114,495,000

STUDY OF VISIBILITY OF APEX BEAT IN

147 WHITE MALES

	Underweight	Normal Weight	Overweight
Apex visible 36	21	14	1
Apex not visible 111	26	52	33
No Gross Disease of Heart or Lungs.			
Apex visible 18	12	6	0
Apex not visible 72	17	36	19
With Circulatory Disease.			
Apex visible 6	2	4	0
Apex not visible 13	1	3	9
With Pulmonary Disease.			
Apex visible 12	7	4	1
Apex not visible 27	9	13	5

VISIBILITY OF APEX

In

DISEASED CONDITION OF CIRCULATORY SYSTEM

With Apex Visible, 6 cases.

- (1) Hypertension without hypertrophy, 3 cases, 2 of normal weight and 1 underweight.
- (2) Hypertension with hypertrophy, 1 case, normal weight.
- (3) Myocarditis with hypertrophy, 1 case, underweight.
- (4) Mitral stenosis, 1 case, underweight.

With Apex not Visible, 13 cases.

- (1) Hypertension without hypertrophy, 5 cases, 3 overweight, 1 underweight and 1 normal weight.
- (2) Cardiac hypertrophy with emphysema, 1 case, overweight.
- (3) Aortitis, 1 case, overweight.
- (4) Myocarditis, 1 case, overweight.
- (5) Coronary Sclerosis, 1 case, normal weight.
- (6) Myocarditis with Emphysema, 2 cases, both overweight.
- (7) Simple Tachycardia, 1 case, normal weight.
- (8) Neuro-Circulatory Asthenia, 1 case, overweight.

Dr. FROST—I have studied Dr. Wilson's paper with profound interest and marked profit. It portrays an era in the art of medicine which, unfortunately, appears to be passing; the era of training and practice primarily by the use of the senses, and only secondarily by laboratory aids. While we may bewail the change, we must accept it as a fact and, to the necessary extent, alter the diagnostic procedures of life insurance medicine to conform with it.

Dr. Wilson has cited four factors in the detection of cardiac disease, actual or potential; the carefully-taken history, the character of the pulse, the quality of the heart sounds, and enlargement of the heart.

At a previous meeting of this Association, Dr. Wilson expressed the high value which he placed upon the use of the

sphygmomanometer in the determination of minor degrees of variation in the pulse which are not readily detectable by the sense of touch. I do not believe that he has had occasion to change this opinion. I consider that a careful observation with the sphygmomanometer, more prolonged than is necessary for the actual determination of blood pressure, is of the greatest value in detecting the slight variations in the regularity and force of the heart action, which may be the early signs of heart disease.

I believe that Dr. Wilson has properly stressed the importance of determining the degree of enlargement of the heart in evaluating the significance of any apparent disease. I have been interested in studying the most recent information which we have upon this subject, the "Medical Impairment Study—1929", compiled by this Association in conjunction with the Actuarial Society of America. The following review of a few of the groups in this study will illustrate the apparent effects of hypertrophy upon mortality.

In the group of apex murmurs, systolic, constant, not transmitted to the left, the mortality of substandard risks, without hypertrophy, was 156%; with hypertrophy, 201%. In the group of apex murmurs, systolic, constant, transmitted to the left, the mortality of substandard risks, without hypertrophy, was 224%; with slight hypertrophy, 234%; with moderate hypertrophy, 476%. The same heart murmurs, with a history of rheumatism or other infectious disease, substandard risks, showed mortalities: without hypertrophy, 278%; with hypertrophy, 337%. Murmurs classed as mitral regurgitation, or "apex murmurs, systolic, not clearly in" other groups, substandard risks, showed mortalities: without hypertrophy, 212%; with slight hypertrophy, 230%; with moderate hypertrophy, 352%. Murmurs classed as constant, presystolic or diastolic, apical, or mitral obstruction, substandard risks, showed mortalities: without hypertrophy, 480%; with hypertrophy, 803%. Constant, systolic, basic murmurs, aortic area, transmitted upward, substandard risks, showed mortalities: without hypertrophy, 257%; with hypertrophy, 478%.

The increase of mortality in the presence of hypertrophy is obvious and greater in extent than I had personally anticipated. I think that these figures offer conclusive proof of the importance of hypertrophy in the evaluation of the significance of apparent heart disease.

Dr. Wilson has commented upon the high mortality rate for policy-holders of large amounts and upon the factors probably responsible for this.

In 1918, we investigated the experience of our Company, by lives, in the large amounts issued over the period from 1875-1916, inclusive, on the basis of the American Experience Table. The data included all cases in which the amount was issued on a single application, together with a small number where the total amount of insurance aggregated the amount indicated. The mortality for amounts from \$20,000 to \$30,000 was 82.4%; \$30,000 to \$40,000, 82.9%; \$40,000 to \$50,000, 34.2%; \$50,000 and over, 62.8%. The total mortality was 79.9%. The mortality of the whole business of the Company, over the same period of time, was approximately 74.5%.

It was interesting to note that, where large amounts were taken in one policy, the mortality appeared to be considerably greater than in those cases in which several policies were taken over a period of time. For instance, for amounts of \$40,000 and over, taken in one policy, the mortality was 93.8%; taken in several policies, 48.5%. For amounts of \$50,000 and over, the mortality, where the total amount was taken in one policy, was 98.4%; when taken in several policies, 59.2%. In our experience for that period, there was undoubtedly a greater hazard in the large amounts taken in one policy.

As for the cases of \$50,000 and more, where an individual policy was issued or where consecutive numbers were issued totaling this amount, on issues from 1920 to '29, inclusive, our mortality, compared with the mortality of a group of the same duration and ages for the Company as a whole, has been approximately that of the Company for the period under review. We have noted, however, a definite increase in the mortality for the years 1925 to '29, inclusive, as compared with the years 1920

to '24, inclusive, which is probably indicative of the trend of mortality in these larger cases in the last few years.

As for the death claims in this group, 30.5%, by amount, were due to diseases of the circulatory system. I have commented, in my own paper before this Association, upon our unfavorable experience with deaths from circulatory disease, in the early policy years, of these policy-holders insured for large amounts. I entirely agree with Dr. Wilson that the chief concern of the Medical Director, in so far as these policy-holders of large amounts is concerned, is to be reasonably sure that, at the time they are insured, there is no evidence of circulatory disease.

With respect to the deaths, and in particular to the early deaths, from circulatory disease, of these policy-holders insured for large amounts, I agree with Dr. Wilson that we have no recourse for our additional protection except, in the first place, to obtain the best possible examiner, who shall be well qualified; who shall be given sufficient time to obtain a careful, accurate history and to make a careful physical examination; and who shall be paid on a basis commensurate with the quality of his services.

The examiner of experience, who has developed his powers of observation to the point at which he sees, hears, feels and smells "with his brain" as well as with the special organs involved, is an invaluable asset to the Medical Director and worthy of his hire. In the matter of percussion alone, the ability to detect, not only the modulations of tones, but, also, that indefinable variation of underlying density or resistance, is none too common. In its most perfect form, it is a natural gift, perfected by practice.

In the second place, we must supplement the work of the examiner by the use of the appropriate laboratory procedures: X-ray, fluoroscope, electrocardiograph, etc.

In a nutshell, the applicant for large amounts of insurance must place himself at our disposal for a sufficiently careful, exhaustive investigation of his fitness, rather than be allowed to impose the conditions or the extent of examination to which

he will submit. This involves concerted action on our part, in insisting upon the proper examination: in the past, a dream; in the near future, we hope, to be realized.

DR. COOK—I have been greatly interested in reading the paper of my old friend Dr. Wilson on cardiac enlargement, and have been refreshed and helped in a reorientation of my viewpoint on heart disease by recapturing the clinical and even bedside atmosphere, as brought to us by a careful, well-trained, and justly eminent internist. Dr. Wilson's contribution is of peculiar value because he is not only an internist of national standing, but an experienced underwriter. Too often the strictly clinical viewpoint of consultants, though stimulating, interesting, and valuable to us, as physicians, nevertheless, fails to directly help and sometimes may seriously mislead our underwriting judgment. Prominent surgeons assure us optimistically that gall-bladder and peptic ulcer cases are as good or better after operation than those less fortunate individuals who have never had the benefit of a cholecystectomy or a gastro-enterostomy, and Richard Cabot has encouraged us to think that a loud systolic murmur at the apex if not accompanied by a presystolic bruit is quite a salutary sign. However cheering and therapeutically valuable such optimism may be as a professional mannerism, I would warn against taking it too literally in underwriting practice.

Dr. Wilson is not only an eminent practitioner, but he is also a teacher of medicine, and I wish that more emphasis was laid by other teachers of medicine to their students on the older and unfortunately out-of-date skill in inspection, percussion, and auscultation in cardiac disease, which the younger practitioner is apt to neglect for the X-ray and electrocardiogram. If medicine becomes too exclusively mechanized, the physician will certainly lose a refinement, a depth and an understanding mastery which the machine can never replace.

Our average examiner in the field would be a better man both clinically and as an examiner if in training and in practice he had a sympathetic appreciation of Dr. Wilson's emphasis on visual and manual diagnostic skill. However, as an underwriter

interested in obtaining a favorable company experience, I agree with Dr. Wilson's reluctant admission that the percussion method of determining cardiac enlargement "in the hands of the average physician, is unfortunately very inaccurate", and further, "from many years' experience as teacher and consultant" he has found "few physicians are capable of obtaining accurate information by percussion".

I was much interested in the anecdote of Dr. Thayer's uncanny skill in cardiac percussion. As a student, I often saw Dr. Thayer percuss the cardiac outline on a cadaver and then insert long needles vertically at intervals on the outline. When the manubrium was carefully removed the needles could be seen just touching the outside of the heart. However, I submit that Dr. Thayer is one in 100,000, and even in the case cited by Dr. Wilson, Dr. Thayer's outline is happily confirmed by the fluoroscope. One would not think of confirming the exactness of an orthodiascope by even Dr. Thayer's percussion, so that for practical underwriting purposes I heartily endorse Dr. Wilson's opinion that "by far the most accurate and easy method of recognizing cardiac enlargement by the average physician is the fluoroscope," especially as it also gives us the breadth of the aortic shadow, a most important point beyond any possible percussion skill. - At the 1927 meeting of this Association I had the privilege of presenting a paper urging the more extended use of the fluoroscope, and especially the orthodiascope, in detecting cardiac hypertrophy in insurance examinations, and again today, when mortality from cardiovascular disease continues to rise, and particularly in the cases of the more heavily insured men at the older ages, I want to reaffirm the importance of the X-ray in these cases. Dr. Wilson says the time is not far distant when the fluoroscope will be as essential in the examining room as a scales. I would add that its evidence is far more valuable, provided ability and experience for competent interpretation are available.

In underwriting as in war, methods of defense must keep pace with methods of offense. Twenty years ago the wealthy man

was receiving medical opinions on his health and longevity from his family physician which were comparable to the data of an insurance blank. Today his clinic annually puts him through a very different examination, including X-ray, electrocardiogram, basal metabolism, renal sufficiency, etc., giving him information with which to select much more intelligently against the insurance companies. When he suddenly decides to take \$100,000 or \$1,000,000 we had better be in a position to trade with him on a basis of equality. As he sees it, it is his business, and it has proven in many cases extremely good business, to protect himself and his family. He does not deem it his business to protect us, if we are satisfied to still depend on the old incomplete requirements while he is coached by modern medicine.

Dr. Wilson says actual or potential heart disease in an individual can only be recognized through one or more of the following factors: 1. Symptoms. 2. Pulse, including blood pressure. 3. Auscultation. 4. Hypertrophy.

In regard to symptomatology, I do not feel quite as hopeless as does Dr. Wilson in regard to eliciting some such evidence in an insurance examination. Often, I think, the evidence may be there, but we overlook it. The most common symptom given by the layman of serious cardiac disease is "indigestion". Frequently even the physician will call the epigastric or sternal distress "indigestion", or perhaps use the older more significant name "heart burn", until the terminal attack reveals the real diagnosis. Even then the diagnosis is still often given as "acute indigestion", and cholecystectomy for a case of angina pectoris is not unknown.

We must regard "indigestion" attacks in applicants over 45 years of age as of grave significance, and a negative fluoroscope and electrocardiogram in these cases, if not absolute evidence, are at least comforting. If the systolic blood pressure is as high as 140 or the diastolic 95, the significance is much more grave.

I wish Dr. Wilson had laid more stress on blood pressure as evidence of cardiac disease, because in an insurance examination it assumes the first importance. Hypertension is our best single

underwriting evidence of cardiac hypertrophy, of far greater significance than percussion or location of apex beat. It is almost safe to say as an underwriting dictum, that if we have hypertension we have hypertrophy, and with normal tension we do not have hypertrophy in the absence of valvular defect or failing myocardium.

On the third point of auscultation, I must take direct issue with Dr. Wilson. He dismisses systolic murmurs as inconsequential unless accompanied by "definite cardiac enlargement", agreeing with the opinion of the advisors of the Surgeon General of the United States Army in the World War examinations. I trust he meant to restrict this opinion to young men in otherwise robust health. Personally, I do not agree that in insurance examinations we can disregard systolic murmurs even in the young "unless accompanied by definite cardiac enlargement", because as already stated, few examiners, if any, can exclude cardiac enlargement without the aid of the orthodiascope, and their statement that there is a systolic murmur without hypertrophy merely means a systolic murmur plus inability to find hypertrophy if present. Therefore, for underwriting purposes I assume it *is* present. But whatever may be the correct position on systolic murmurs in the young, I think there should be no misunderstanding from an underwriting viewpoint that any heart murmur beyond age 30 is highly significant, and beyond age 45 of the gravest import, and may indicate dilatation and an early fatal termination. "Functional" constant systolic murmurs in elderly men applying for life insurance, as a practical underwriting sign in my opinion, are non-existent, nor would I be influenced by the eminence of the cardiologist who ventured so optimistic a diagnosis.

I think Dr. Wilson might well have added a fifth factor in cardiac diagnosis to the four mentioned, and that is, the electrical phenomena as shown by the electrocardiogram. While admitting that our interpretation of the electrocardiogram is still tentative on many points, nevertheless, there are certain well-established variations of sufficiently proven significance to

give us very valuable evidence of the presence of serious myocardial disease. The electrocardiogram is being used in life underwriting, and I believe it will have for us an increasing field of usefulness.

Again, I want to thank Dr. Wilson for the pleasure and benefit in reading his paper, and for the privilege of discussing it.

DR. BRADSHAW—May I say just a few words in connection with the sub title of Dr. Wilson's paper "The Visibility of the Apex Beat"? In our office we have a young man who has spent two years in the Cardiac Clinic at Bellevue Hospital. He showed me a procedure used in that Clinic in cases where the apex beat cannot be seen. Take a pen or soft pencil and crosshatch on the skin where the apex beat should be, an area about two inches square. This gives a background of added visibility. In many cases apex beats that could not be seen or appeared diffuse on the plain skin came into view and could be localized by using this method of crosshatching. It has helped me quite a little in determining the location of the apex beat in doubtful cases and I am sure it has brought out the location of the apex beat in some cases where it was apparently invisible.

DR. WILSON—I thank Drs. Frost and Cook for their discussions of my paper, which are more valuable than the paper itself, in my opinion.

In the figures quoted by Dr. Frost from the Medical Impairment Study, the term "without hypertrophy" is inaccurate, and should be "no hypertrophy noted", as I believe that at least 50% of the cases classified as "without hypertrophy" would show hypertrophy if a six foot film were made, or measurement made with fluoroscope.

I agree absolutely that the value of the breadth of the aortic shadow is most important in ages after forty-five, and even Dr. Thayer, with all his skill, I do not believe can recognize that slight increase in breadth which is one of the most important

signs of aortic sclerosis, a forerunner of coronary disease not infrequently, so that the fluoroscope does give you help there that cannot be obtained in any other way save with the "six foot film."

I quite agree with Dr. Cook that a systolic murmur, apparently unaccompanied by hypertrophy cannot be ignored, but I do believe that it could be rated less high if we could be sure that there was no cardiac enlargement. It must be remembered that the soldiers examined and accepted for service with a systolic murmur and no enlargement were examined by "Cardiovascular Boards", one or more of whom were specialists in heart disease, and their opinion as to enlargement would be of far greater value than the opinion of even an unusually well trained medical examiner of a life insurance company. I also agree with Dr. Cook that murmurs, irrespective of the size of the heart, increase in importance as age goes on, and, personally, I do not believe that there is such a thing as a true functional murmur beyond age 40. This murmur that is so-called functional means generally that the myocardium is not functioning, and as a rule after 40 a "tired myocardium" is a diseased myocardium. I believe that the only functional murmur that you can put down as being of slight importance is the one that occurs in a young person, is not transmitted, is only heard either in recumbent or upright position, but not in both, is unaccompanied by cardiac enlargement, unaccompanied by blood-pressure changes, and, finally, is also unaccompanied by tachycardia or pulse changes, such as intermittencies or change of rate, and even in these cases I feel that the underlying cause for such functional murmur may be of such importance that it effects the longevity of the risk.

I failed to mention the electrocardiograph for the simple reason that I was trying to deal with the means of examining that very large group of cases which I classified as doubtful. I don't believe any of us would advise that every man whose age is 45 or over, should have an electrocardiogram made. I think, however, that the time has come to have a fluoroscope in the well appointed medical office, or in the office of a general

agency in a large city, and I think that the expense incidental to that can be well borne and can give us information of value. I think myself that the electrocardiogram is invaluable when positive. When negative it does not in the slightest degree rule out coronary disease. All of us know too well cases which are typical cases of coronary thrombosis and die a typical death of coronary thrombosis, and yet the electrocardiograms made during the period of the disease have been negative.

The visibility of the apex beat. Remember that this study was based *not* on a group of patients coming to a cardiac clinic. You of course find a much larger percentage of apex beats visible in those who have hypertrophy or cardiac disease of any kind, whether functional or not. This study was based absolutely on a group of cases where there was either no disease present or definite disease of organs other than the heart, and you might say it gives a cross section of the average person coming up for examination in the age period of 30 to 45.

In question of big cases, we all, as Dr. Cook says, should make use of every means of detecting circulatory disease, just as the man who wants to protect himself makes use of all means in getting information which he hopes will prolong life at any rate. So we will have to do the same.

There is a very pernicious habit we Medical Directors allow, in my opinion, as to what we call "brokerage cases", where we put an examiner on our list because he is helpful to the agent. That man will examine the same individual for ten companies making only one examination, and he will write out ten reports. In all probability, while he may be a good examiner, he is not in the class with the chief examiners of our companies, and that man is, you might say, making the examination for us in the relatively large cases, not a "Jumbo" case to any one company, but a "Jumbo" case in total amount involved. The only solution, that I can think of, is for the Insurance Companies *as a group* to designate in every large centre of population one or two physicians skilled as examiners and as clinicians with laboratory experience to act in "brokerage cases".

CIRCULATORY IMPAIRMENTS
A FEW COMMENTS ABOUT THEIR EARLY
DETECTION AND THE EVALUATION
OF THEIR SIGNIFICANCE

BY HAROLD M. FROST, M. D.

Medical Director New England Mutual Life Insurance Company

At the time of the meeting of this Association last Fall, we, of the New England Mutual, were carrying on an investigation of the results of our attempt to select, upon a standard basis, risks with various types of circulatory impairment. At that time we were able to give the substance of these results. As the investigation was incomplete, there were some details lacking.

This paper will be intentionally brief. It will deal only with a few developments of our practice which have impressed us as being of significance. We appreciate, in view of the limitations of our experience, the comparatively small amount of material and the shortness of duration, that these developments to the present must be considered as suggestive rather than conclusive.

The first requirement of the art of selection, fundamental and indispensable, is the ability to detect impairment of the circulation. The second, is the ability to evaluate its significance.

With respect to the detection of circulatory impairment, no comment is necessary as to that which is obvious in the course of the ordinary, careful, physical examination. There is another type of circulatory impairment, however, which frequently is not detected or detectable by physical examination, which is a serious problem to all of us. I refer to the type which results in early death claims from circulatory disease, in the case of policy-holders of middle age or above, prosperous from years of labor and close application to business, insured for considerable amounts.

In 1928 this problem seemed so acute to us that we made an effort to determine whether there was any way in which we could bring about a diminution of the losses from this type of circulatory impairment. I wish to devote a small amount of time to this, inasmuch as I think the results of our efforts develop a point of view which is of decided interest and value.

From the Company's experience for the year 1927 we noticed that out of a total of 1,421 claims, 203 or 14.3% occurred during the first five years. Of this latter group 45—22% of the first five year claims and 3% of the total—were due to heart disease. Of these, angina pectoris, coronary sclerosis and thrombosis accounted for 49%. The insurability of these policy-holders did not in any way appear doubtful. They had been carefully examined, 35% of the examinations made by Chief Examiners.

The following will illustrate a few of the cases which I have in mind: a man of 45, examined by Chief Examiner, developing angina pectoris one year and five months after examination and dying two years and a half after acceptance; a man of 41, dying, three years after acceptance, from angina pectoris said to be the first attack; a 42-year-old man, examined by Chief Examiner, dying eleven months after acceptance, death occurring suddenly after changing a tire on the road and before he could be seen by a physician; a man of 43, examined by Chief Examiner, dying, four months after examination, from angina pectoris of two days' duration said to be the first attack; a man of 58, examined by Chief Examiner, who died nine months after examination while playing golf, death said to be due to acute coronary thrombosis.

It occurred to us that our Chief Examiners might have something of value to offer in solving our problem. Under the direction of Dr. David N. Blakely, one of my associates, letters were written to our Chief Examiners, about sixty in number, asking for their comments and recommendations. We enclosed the abstracts of twenty cases in which claims had occurred during the first three policy years, the shortest duration being six weeks and the longest three years. Six of the policies were in force less than one year. To illustrate the importance of this problem, the total

amount of insurance involved was \$520,000, individual claims varying from \$1,000 to \$135,000, the average of twenty claims being \$26,000. The cause of death was given as angina pectoris in fourteen cases, apoplexy in one, coronary thrombosis in one, pericarditis and nephritis in one, and myocarditis in the remaining three.

Needless to say, no definite solution of the problem was obtained. The replies, naturally, varied according to the personal point of view of the writer. However, there was a marked concurrence in the opinion that the chief method of attacking the problem was through the obtaining of more accurate personal histories. Emphasis was laid upon the necessity of carefully questioning applicants, particularly those over 40, as to any symptoms of possible circulatory impairment. Several advised specific inquiries as to infectious diseases and a search for latent or chronic foci of infection. Frequent reference was made to the value of routine Wassermann tests, electrocardiograms, X-ray examinations and blood chemistry in doubtful cases. A few advised examination of the eye-grounds in doubtful cases, and in all cases involving large amounts of insurance. One predicted that, in ten years, all companies would require an electrocardiogram whenever the applicant is over age 40 and a policy of \$10,000 or more is involved.

I am inserting here a few quotations from these letters in elaboration of the points indicated above.

"I think a more carefully taken, detailed history and a careful study of this history would be of immense advantage."

"My personal reaction is to bear these histories in mind and to try to elicit from the applicant a history of anything that might point to a lesion of the heart or any part of the circulatory system. It seems to me that more can be accomplished by additional care in taking the history than by additional refinements in the physical examination."

"A carefully taken history is the most important means of detecting heart disease and this is especially true regarding angina pectoris. The fact is that angina pectoris

has to be recognized, in the vast majority of cases, from the history alone because the findings are usually negative. One almost pathognomonic symptom is pain on walking and when the patient stops the pain lets up. Many times patients do not realize the seriousness of this symptom and will not mention it unless asked directly about it. To cover this point I suggest that you add to your application blank—"Have you ever had pain or distress in the chest or abdomen on walking?"

"I doubt if the history is gone into insufficient detail. It often isn't the patient's or the applicant's fault that an important item of history is overlooked: he often does not think of it or consider it worth mentioning. The most careful questioning is necessary, even with patients doing their best to co-operate, in order to bring out the facts, and it must be much more difficult with those whose primary object is to get insurance. Such questioning, however, requires time and a background of experience, far more time than the physical examination. After all it is a matter of having highly trained examiners who are conscientious and not in too big a hurry."

"It seems to me that the chief fault is in the history taking, particularly as regards circulatory symptoms. There are many premonitory or suggestive symptoms that could be discovered in some of these cases, I think, if a more detailed history were taken by the examiners and if the response of the heart and blood pressure to exercise were more carefully ascertained."

"Personally I do not believe we have sudden deaths from disease. I mean that we have warning symptoms if they are recognized."

"In the twenty cases, there were eight who stated in their personal history that they were 'never ill'. While in some instances this answer might be accepted, a closer and more detailed questioning will, in most cases, reveal illnesses which might be considered by the applicant as inconsequential, but which are, in fact, extremely important."

"It is impossible to estimate the longevity of persons over the age of forty-five whose occupations are sedentary; who are heavy eaters—especially at evening banquets—whose habits are irregular relative to food, sleep

and rest; who take no exercise except walking to and from their places of business. Many of these are excessive smokers and possibly heavy coffee drinkers and they sometimes use alcohol. This is the class which have passed the meridian of life. They feel more need of larger policies and they are financially better able to handle larger premiums."

"Hypertension may not necessarily be present at the time the patient is examined, although it has been present previously. Consequently, it is possible to find a patient with a normal blood pressure record who, nevertheless, has degenerative changes in the heart muscles or elsewhere due to this condition. It has been shown that examination of the eye grounds with an ophthalmoscope will almost invariably show changes in the small arteries of the fundus which are characteristic of essential hypertension, whether the blood pressure is high at the moment or not. It would seem that fundus examinations in the hands of a trained observer would give much more accurate knowledge of the condition of the blood vessels than any other single method."

Within the last year, we have revised our examination blank, incorporating questions as to pain or pressure in the chest, dyspnoea, palpitation and dizziness or fainting spells, focusing the attention of the examiner upon this problem of the earlier detection of circulatory disease to a greater degree than formerly.

As to more refined methods of examinations, I am satisfied that the electrocardiograph and the X-ray have a definite and well-deserved place. There are manifest practical limitations to their use in life insurance examinations. Nevertheless, in older individuals, applying for considerable amounts of insurance, I believe that they are of definite assistance. The recent effort to develop concerted action along these lines, to insist that applicants for large amounts of insurance submit to a careful and exhaustive physical and laboratory examination, is worthy of our hearty support.

With respect to the evaluation of the significance of circulatory impairments, in the light of our own experience for the last nine

years, we have noticed a few developments and arrived at a few conclusions which, in some respects, have altered our practice.

Last Fall I reported to this Association upon our investigation of 4,936 lives which we had insured during the previous eight years with the aid of the cardio-respiratory test. The impairments involved were, in the main, circulatory. The mortality of the whole class, by the American Experience Table, was 42.32%.

Of this group, 2,523 lives presented a heart murmur of some sort as the chief impairment. The mortality of this latter group was 46.36%. Dividing these murmurs according to type and location, we found that the localized, pulmonic, systolic murmurs gave a mortality of 18.16%; systolic murmurs localized at the apex, 57.14%; systolic murmurs loudest at the apex and heard over the whole heart area, 63.42%; systolic murmurs at the aortic area and transmitted upward, 67.11%; systolic murmurs at the apex, transmitted to the left, 78.56%; diastolic and presystolic murmurs, 234.37%. These sub-groups were small and, for that reason, the results are to be considered only as suggestive.

The first thing of interest to be noted is that our mortalities in these sub-groups vary directly in accordance with our clinical impressions as to the significance of the type of murmur involved. In other words, the mortality is lowest in the localized, pulmonic, systolic murmurs, somewhat higher in the systolic murmurs localized at the apex, definitely increasing as the type of heart murmur becomes more suggestive of organic heart disease.

The result in the class of diastolic and presystolic murmurs is probably not a matter for surprise. This group was small, comprising but 53 lives, with 3 deaths. As a rule the murmur was not complicated by any obvious enlargement of the heart or other circulatory impairment. We tried to select the most favorable type. I am satisfied that risks with this type of impairment cannot be selected upon a standard basis. We have discontinued any attempt to do so.

Mortalities of the apical, systolic murmurs, transferred to the left and upward over the body of heart, are higher than we care to have them for a period of time as short as this. In the effort

to reduce these, we are insisting that only those risks be accepted in which the reaction to the cardio-respiratory test is normal in all respects. We have found in the course of this investigation that, in so far as the whole group of 4,936 lives is concerned, with a mortality of 42.32%, if we had declined in all cases where the reaction to the test was suggestive of hyperactivity, and in certain cases where it was, in some respects, atypical—a total of 950 lives—we should have had a resulting mortality of 34% by the American Experience Table.

As to the systolic murmurs heard loudest over the aortic area or localized there and possibly transmitted upward to the vessels of the neck, we have insured a few, a total of 35. There has been one death with a mortality of 67.11%. This group, of course, is too small to be of any significance. I am, however, satisfied that there is no likelihood of our being able to select standard risks in the presence of this impairment. We have discontinued attempting to do so.

In the class of risks whose chief impairment was an irregular heart action, our mortality was 76.86% by the American Experience Table. Of the 348 lives in this class, 72% were under age 45 at issue. The age at issue made no apparent difference, the mortality for ages at issue under 45 being 75.99%; over 45, 77.37%. As we were satisfied that these figures were too high for the period of exposure and that our method of selection was not giving us adequate protection, we began, a year ago, to call for electrocardiograms in all cases of irregular heart action. In the field, we are accepting those made by specialists whose qualifications are acceptable to our Chief Examiners. We have installed an electrocardiograph at our Home Office. Our experience during this past year, while of course not measurable in terms of mortality, has satisfied us that we cannot depend upon our Chief Examiners, in all cases, to advise us accurately as to the exact nature of the irregularity which is present. Needless to say, it is essential that we know the exact nature of the irregularity. In this respect I believe the electrocardiograph to be of the greatest value. About 75% of the electrocardiograms, requested by us, have been

made on account of irregular heart action found on examination or in the past. About 31% of the electrocardiograms, made for this reason, have proved to be abnormal and have resulted in declination of the risk.

To cite examples: in one case, two of our examiners, one of them a Chief, reported extra-systoles. The electrocardiogram showed a sino-auricular block. We declined the risk. While appreciating that there is a difference of opinion as to the significance of sino-auricular block, we have followed one particular case of this type over a period of five years, at the end of which the individual dropped dead while sprinting for a train. We do not care to insure individuals with this particular impairment. In another case, an apparently healthy, vigorous girl of seventeen years of age, there was a report of pulse rate under 55. The electrocardiogram showed a pulse rate of 48, with heart block. These examples are, of course, commonplace and are submitted merely as instances of the value of the electrocardiograph to us. We would not dispense with it.

There is no question in my mind that we shall be able to eliminate, by the use of the electrocardiogram, a large number of the more serious types of irregularity, which cannot be definitely detected by the ordinary clinical examination. Whether this additional elimination will be sufficient to enable us to control the mortality remains for future solution.

In the beginning, our effort to select standard risks, in the presence of circulatory impairments, was based upon theory to a considerable extent. We are now obtaining the results of our practice. The foregoing comments are offered solely with the desire to inform the members of the Association as to the working of our plan of selection, to make available to you the results of our experience, favorable and otherwise.

DR. OLSEN—A survey of death claims over a five year period, in the company I represent, reveals a sharp relative, as well as absolute, increase in deaths due to heart disease during the period. While the group, of necessity, is small, it probably reflects quite accurately the experience among insured lives of like ages and durations during this period, and the table is included here in the discussion, as indicating the trend.

It is noted that the heart deaths by number were twelve per cent. (12%) of the total for 1926, increasing to nineteen and five-tenths per cent. (19.5%) in 1930. The corresponding ratios by amount were thirteen per cent. (13%) and twenty-six per cent. (26%), the high figure for last year being due to a few larger claims. For the five year period, heart deaths represented fifteen per cent. (15%) of the total deaths by number, and eighteen per cent. (18%) by amount. Sixty-six (66), or twenty-eight per cent. (28%), of the heart deaths occurred within the first five policy years.

TOTAL DEATHS			HEART DEATHS			
Year	No.	Amount	No.	% Total	Amount	% Amount
1926	260	622,000	31	11.9	82,000	13.2
1927	269	632,000	36	13.4	84,000	13.3
1928	331	715,000	40	12.1	93,500	13.1
1929	349	875,000	59	16.9	168,000	19.2
1930	370	979,000	72	19.5	259,000	26.4
Total	1579	3,823,000	238		686,500	

I also show an analysis of the heart deaths by cause during the five year period. The point of interest is the increasing frequency with which coronary artery disease is being diagnosed. In general, one may note on detailed study of the death claims, a definite trend toward a more accurate and specific diagnosis of heart conditions, in line with our newer conceptions and the increasing interest of the profession, generally, in anything pertaining to the heart. For the period, coronary disease represented thirty per cent. (30%) of all the heart deaths, and for the year 1930, fifty-six per cent. (56%).

ANALYSIS OF HEART DEATHS BY CAUSE

	1926		1927		1928		1929		1930	
	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.	No.	Amt.
Endocarditis.....	10	20,500	10	19,000	6	15,500	11	20,000	6	6,500
Myocarditis.....	6	9,000	9	23,500	13	29,000	16	45,500	22	44,250
Acute Dilata- tion.....	2	3,000	8	27,000	4	9,500	13	46,500	9	38,500
Coronary Art- ery Disease.....	7	14,500	5	5,500	8	22,000	16	46,000	26	130,750
Misc.....	6	35,000	4	9,000	9	17,500	3	10,000	9	39,000

With the increasing deaths from heart disease in the population at large, and our manifest inability to exclude an excess of early heart deaths among insured lives, it is but natural that search be made for more satisfactory methods of determining the adequacy of the circulatory function. The grosser heart lesions, discovered and identified in the usual routine examination, do not offer special difficulty, and are dealt with in a fairly satisfactory manner on the basis of accumulated statistical data. A higher death rate is expected and the premium rate is adjusted accordingly.

The difficulty arises in connection with the heart lesion which gives no evidence by the usual, and often the more refined, diagnostic methods, or escapes the attention of a less observing and painstaking examiner. It is in the group of insured lives, deemed normal at the time of acceptance, that the early and excessive death rate from heart disease occurs.

The character of the examining staff is well within the control of each company and it should be possible, generally speaking, to exclude the unreliable and inefficient examiner. More serious is our inability to develop many existing but latent cardiac disorders by the ordinary, and not infrequently, by any known methods.

The work of Dr. Frost of the New England Mutual, in developing the cardio-respiratory test, directed to a better differentiation of the good from the bad among the clinically diagnosed cardiac lesions, and to an earlier recognition of the evidences of heart disease in other disorders likely to terminate in a heart death, deserves the sincere appreciation of this association. The results in the heart murmur groups reported by Dr. Frost are of interest. While the business is largely in the select period, it is obvious that

the mortalities experienced in all groups generally considered organic in nature, are well above the normal for the company, and exhibit the general trend which our experience, clinical and insurance, would lead us to expect. An analysis by age groups and durations, and expressing the ratios in terms of the company's or some other current experience, would have been of further interest, and would have given a better basis for comparison with similar groups reported by other companies. The study reported is of distinct value in confirming our present views as to the insurability of the heart murmur groups and it is to be hoped that, as the use of the cardio-respiratory test is extended, it may prove an aid in the further refinement of our heart murmur groups.

Of little less interest is the group of heart irregularities reported by Dr. Frost. The mortality was high at the younger as well as older ages. Dr. Frost very properly urges the need of knowing the exact nature and type of irregularity, and that the electrocardiograph is of the greatest value in identifying cardiac arrhythmias.

From our present knowledge of the physiology and anatomy of the heart and the mechanism of cardiac irregularities, there would seem to be little to justify our present classification of arrhythmias, based on number or frequency of the irregularity. If we continue to consider cardiac irregularities for insurance, our groupings must be made to accord with the now universally accepted classifications based on clinical and electrocardiographic study.

The questions of greatest interest, raised by Dr. Frost, are those dealing with the unrecognized and unreported circulatory impairments and means for their earlier detection. Except for the grosser lesions, which escape detection by the indifferent examiner, the majority of unrecognized cardiac impairments will fall within the coronary artery disease group.

There has been an awakening of the profession generally, following the pioneering of James B. Herrick, to the importance of this disease group, and with it has come a better appreciation of the disease process and clinical picture. To those of us who are not in immediate and daily contact with the sick, there is danger

of getting out of touch with the advances which are constantly being made in the science and practice of medicine, and that, as a result, we may lack the knowledge and sympathetic understanding necessary to get the most out of our examiners.

Without some knowledge of the extent and distribution of the coronary circulation, and without a correlation of the anatomic structure with the clinical picture and necropsy findings, there can be no correct understanding of this disease and the variability in its clinical manifestations. The basic pathology of the various clinical entities, known as angina pectoris, coronary sclerosis, thrombosis, embolism and occlusion, is a sclerosis of the coronary arteries and this condition of the coronaries is a part of a more or less generalized arteriosclerosis. There appears to be no parallel between the clinical symptoms and the anatomic findings, although it has been noted that cases associated with angina are likely to have more pronounced sclerosis of the vessels and greater reduction in lumen. In a series of ninety-one (91) autopsies with coronary sclerosis, reported by Morawitz and Hockrein (*Münch. Med. Wochensuch.*), there were no clinical symptoms of heart disease in seventy-five per cent. (75%) of the cases. Willius and Brown, at the Mayo clinic, report a series of eighty-six (86) cases with necropsy findings where death resulted from coronary disease. Twenty-one (21) cases gave a history of angina pectoris and in twenty-two (22) the clinical picture was that of myocardial failure without pain, while in thirty-four (34) cases, (40%), symptoms were lacking or insufficient to make a diagnosis of coronary disease. Even following coronary occlusion,—the terminal manifestation of many cases of coronary sclerosis,—recovery takes place and little or no clinical or other evidence may remain. Thus Connor and Holt (*American Heart Journal*) report a series of one hundred seventeen (117) cases of coronary occlusion where recovery took place in ninety-three per cent. (93%) and twenty-one per cent. (21%) remained well after five years.

These post-mortem studies combined with clinical histories indicate clearly how difficult or impossible the diagnosis may be in individual cases. A carefully taken history, as our most important

means of detecting coronary heart disease with symptoms, is emphasized in the replies of the New England examiners, and echoes the opinion generally held. Any upper abdominal or thoracic discomfort or pain during the arteriosclerotic age, and particularly when the symptom co-exists with slight or moderate exertion, should arouse suspicion. Added questions may be of further value in eliciting a history, and should have a place in the blank, but personally I am convinced that the answer to the heart problem as it concerns life insurance, must be sought in the type of examiner employed. With a better appreciation at the home offices, of our present limitations in diagnosis of circulatory impairments, and by extending a wider latitude to the well trained and experienced physician in the scope as well as in the extent of his examinations, we should succeed in measurably reducing the number of impaired hearts among insured lives.

DR. CLARK—We are all greatly indebted to Dr. Frost for his excellent paper on the early detection of circulatory impairments. Dr. Frost, in conjunction with his associates, has devoted nine years in an effort to more accurately establish a basis on which to select standard risks from that large group presenting suggestive evidence of circulatory disease. We have all been greatly interested in the results of his study of a test of circulatory efficiency. This study is essentially a research investigation in which it is desired to ascertain whether a definite correlation exists between present cardiac efficiency and longevity, and to ascertain the value of such a test in life insurance underwriting. Many tests of the functional power of the heart have been developed by clinicians but one author concludes that "the results have been notoriously unsatisfactory". For purposes of insurance underwriting, however, a supplementary test of this type may prove to be of great value in concentrating the attention of the Examiner or the referee for a considerable period of time on the circulatory system. Whether favorable results when secured are attributable to the test, per se, or to the high efficiency and good judgment of the trained experts who

apply the test, it will be difficult to conclude. There is no doubt, a high degree of superselection in the risks which have been placed on the books as a result of this test, requiring in many cases a special examination by the chief Examiner and in some cases an electrocardiogram by a specialist. A chief function of the medical department of an insurance company is to sort risks, and any additional test which may be applied and which will assist materially in the selection of risks is well worth while. Whether future experience will prove that the test, itself, is valuable or disappointing in its results, we will, notwithstanding the results, still be greatly indebted to Dr. Frost and his associates for the tremendous amount of effort and time which they have given to the experiment.

We agree with Dr. Frost in all that he has said concerning the necessity of acquiring more accurate histories from our applicants if we are to properly distinguish between the desirable and the undesirable risks insofar as early circulatory deaths are concerned. Insurance companies, however, are at a great disadvantage in securing reliable histories from their applicants. Some applicants desire to admit nothing which will prevent them from securing insurance. The Agent too often is anxious that the applicant conceal from the Examiner information of an adverse nature and in many instances, without question, the applicant has been carefully coached before he has submitted to the examination. Just how we can arrive at the true facts under such a condition is our problem. This problem is a difficult one and it is likely that we will never be able to obtain a 100% efficiency in history taking by our Examiners, although such a degree of efficiency might be obtained in clinical work.

Psychologists have stated that 83% of the knowledge which we obtain is obtained through the eyes and only 17% through the ears. Perhaps a similar relationship may be expected in insurance selection. Our application blanks fully cover all or the majority of questions which may be asked with the intention of uncovering the early evidences of circulatory disease. We do not, however, as above stated always secure proper answers

to these questions, and although the primary fault, no doubt, lies with the applicant, our Examiners in many cases are not alert, and the history taking is conducted in the most casual and hasty manner. There is need for greater co-operation between the Home Office and the Examiner in this particular essential.

There is very little question as to the great value of trained observation on the part of our Examiners in arriving at conclusions as to the health status of an applicant. Have we placed upon our Examiners sufficient responsibility for acquiring for us very definite impressions as to the physical condition and the probable longevity of the risk? We are all acquainted with a few Examiners who are most capable and who have the proper conception as to what is expected of them. Illustrative of this type of Examiner, who is unfortunately too infrequently found on our list of Examiners, I wish to cite the following history, the details of which I have obtained from the Examiner direct.

An applicant was brought to the Examiner's office to be examined for a large amount of insurance. He was a prominent man with considerable wealth and although the Examiner knew him by reputation he had no personal acquaintance with him. Covering his history he mentioned some digestive disturbance for which he consulted his family physician, later going to Johns Hopkins Hospital for the purpose of a physical checkup where he was pronounced to be in good health. The Examiner stated, "I made a physical examination and found everything normal, however, it was that something, call it a "hunch" or what you may, about the risk which I did not like. His expression aroused suspicion of impaired health, and I was inclined to consider the digestive disturbance which he had mentioned as something more serious, and in all probability, Cardiac. I reported this, confidentially, to the Medical Director who, I believe, obtained a report from the Johns Hopkins Hospital setting forth that their findings had been that of a normal individual. I then followed the case to his family physician who,

fortunately, was an outspoken, honest man and he stated that the applicant had had a definite typical attack of Angina Pectoris on at least two occasions.

"I quite agree that the taking of a careful history is important and the Examiner is placed at considerable disadvantage as applicants for insurance are inclined to forget or minimize past illnesses so that it is necessary for an Examiner to analyze statements the applicant may make and attempt to determine whether or not they have a direct or indirect bearing upon the risk. In the above cited case I am inclined to believe the applicant was truthful in his statements and undoubtedly felt that his condition was that of indigestion and his physician, who admitted to me that it was Angina Pectoris, may not have informed the applicant fully as to the seriousness of his condition.

"The subject has so many angles that can not be referred to in this communication, but as to the one with reference to observation of the general appearance of the applicant, I think this is one of the most important and the Examiner is the one who has the opportunity of observation."

This Examiner did for his company, through observations, what we might expect of the majority of our Examiners. A keen eye is often of more value than a keen ear and a glib tongue. We all know the type of Examiner who knows more concerning the insurability of a risk when he sees the applicant come into a room than many Examiners would know after a most conscientious examination conducted by ordinary procedure.

Another illustration is the following: An applicant applied for \$300,000 insurance in three companies. The first blood pressure readings were relatively high. The Examiners were asked to secure additional blood pressure readings. Two of the companies approved for their limit—one company after the applicant had been examined by a referee. In view of the action of the other two companies, the third was asked to reconsider its action. One of the medical staff was sent to investigate the case and he found that the blood pressure was slightly above

their acceptable limit. His recommendation to his company, however, was that irrespective of any future favorable blood pressure readings the company should never accept the risk, for applicant's general appearance indicated chronic vascular changes. Within three years the applicant dropped dead while playing golf.

I believe that we all owe it to our companies to take steps to secure from our Examiners greater efficiency in history taking and to develop in them keener powers of observation. We are fortunate in having thoroughly discussed during this convention special heart tests and we are all fully alive to the possibilities of their use in insurance selection. However, without question, over 90% of the risks that are placed on our books have been and will be accepted on the basis of examinations made by our regular Examiners and without the aid of elaborate machinery. The efficiency of their work, therefore, will largely control the mortalities which we will experience and although it is quite proper that we should fully investigate the value of supplementary tests for special cases, we will do well to improve upon the quality of the work of our Examiners and where possible upon the tests which may be applied in routine examinations.

DR. WILSON—I happen to be one of the chief examiners that Dr. Frost mentioned and I did not answer the letter, which I should have done. My comment would have been exactly the same. There was absolutely not enough data furnished.

There is one point I wish to bring out. I have been chief examiner for the New England Mutual and I can't help but be impressed by the psychological side of where the examination was made. In other words, in the cases which I examined at their office in Baltimore, which is well equipped, quiet and in every way an ideal examining office, I never did begin to get the data from those coming up for conservation examinations or general examinations as I did when they came to my own private office. Now, when you allow examinations to be made

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in a man's office or a man's home, you are going to get just that much less data.

DR. DALEY—Dr. Frost referred to the fact that he had incorporated two or three extra questions in his medical blank following the suggestions of his examiners. Can he tell us whether those questions have brought any beneficial results?

DR. FROST—I wish to thank Dr. Olsen and Dr. Clark and the others for their discussion. I have very little to add. With respect to Dr. Daley's question as to the effect of the incorporation of these additional questions, the only way I can evaluate that effect is by saying that I have noticed a few instances in which attacks of apparent angina pectoris and thrombosis have been brought out by these questions.

Now just a word there. My whole instinct and the instinct of the Medical Department—and it was the instinct of Dr. Dwight, I believe, who preceded me—is to depend upon the examiner rather than upon any set of questions or any blank however complete or thorough which you could require him to fill out. After all, as I expressed myself in the paper, an examiner must see, feel and hear with his brain. He must take in what his senses are trying to convey to him and evaluate it, and that means special training, special ability. I am satisfied that no blank will give us the protection that we can get from a first class chief examiner, picked by a representative from the Medical Department for his ability and all the other qualifications and paid on a basis commensurate with his private income. Thank you.

DR. ROWLEY—In my remarks at the opening of our meeting this morning, reference was made to the important contributions to our work made by or with the aid of the actuaries.

I reminded you that some years ago our Association exercised the great wisdom and foresight to invite to Honorary member-

ship a small and select group of actuaries. In that select group there was one whose work has been always our guide and whose word has commanded our attention. He has no peer in the field of investigative work in underwriting.

His latest work, recently put before us in the form of tabular mortality experience in various medical histories and impairments, tells us some queer looking tales in numerical terms. At least to the uninitiated they look queer.

Some remarks by him on this work have been printed and placed before you for study. We know that he can throw light upon what to some of us are dark and rather mysterious matters, and the Association is particularly fortunate in having the opportunity at this time to listen to Dr. Arthur Hunter. Dr. Hunter.

COMMENTS ON THE MEDICAL IMPAIR-
MENT STUDY (1929)

BY ARTHUR HUNTER, L. L. D.

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While the impressions from the results of the work on the new Medical Impairment Study are fresh in my mind, I am submitting them to you for what they may be worth. Some of these are indicated in the text but I should like to emphasize them.

In the epoch-making Medico-Actuarial Mortality Investigation all the cases were accepted as standard except those treated sub-standard on account of family history. In the present investigation the policies were divided according to whether they were accepted on a standard or sub-standard basis. In the M. A. M. I. the mortality of cases accepted as standard was 117% among those with medical impairments. In the new investigation the mortality was 106% for standard risks and 184% for sub-standard risks. It appears, therefore, that the companies in the M. A. M. I. had accepted as standard many cases which should have been treated as sub-standard, while the increased knowledge since that time had resulted in a lower mortality on cases with medical impairments accepted as standard risks. Combining the standard and sub-standard in the present investigation the relative mortality is 132% against 117% in the M. A. M. I. While the results are not widely apart in the aggregate, the difference in certain groups between the M. A. M. I. and the new study or between the standard and sub-standard is important.

The great effect of selection is apparent in the present study. The two companies which contributed a large proportion of the material in the standard classes and which did not issue policies on sub-standard plans must have made a very careful selection as the mortality was only 6% above the average. Under cases accepted as standard it should be kept in mind that the further the

expected departure in mortality of the group from the normal, the smaller percentage of applicants would be accepted in the standard class. The proportion of cases accepted might therefore vary from 5% to 50% of the applicants, depending upon the seriousness of the impairment. It may be mentioned at this point that, omitting the groups with alcoholic habits, the mortality among standard cases was higher than 108% in the cases only of syphilis, 151%, history of pleurisy, 128%, history of biliary colic, 116%, albuminuria, 117% and excessive abdominal girth, 124%.

Another factor which influences medical selection is the result of an adverse mortality experienced in our own Company or in a group of companies. There is almost sure to be a more severe selection which might even convert an unfavorable into a favorable mortality. The effect on the younger group of medical directors and underwriters is usually more drastic than on the older men.

In considering the results it should be noted that nearly 25% of the sub-standard material was received from one company and an equal proportion of the standard from another company. In a number of impairments three-quarters of the data were obtained from a single company or from two companies so that their methods of selection had a preponderant effect on the resulting mortality. In this connection it is interesting to note that the large proportion which a few companies gave to the total data in the standard classes was partly due to experimenting with certain types of impairments or to a more favorable view prevailing with regard to such impairments than was generally held. For example, two companies had a large proportion of the cases on certain types of heart murmurs, one of casts, one of biliary and renal colic, one of irregular or intermittent pulse and one of overweight, glycosuria and syphilis.

Future Investigations

The foregoing conditions have brought me to the conclusion that a collective investigation is not always the best guide and that a different method in the future might produce better results. In order to obtain the effect of uniform selection of risks, whether

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liberal or stringent, would we not get a better view of the situation if the next investigation covered the data of (a) one or two large companies doing standard business alone, (b) one or two companies, or two companies combined, with a long record of having issued both standard and sub-standard business on a broad experience? Of course it would not be fair to ask the companies thus selected to make the investigation at their own expense especially if all the impairments in our code were studied at one time. These companies, however, might be prepared to make investigations at their own expense if certain types were studied each year. For example, we might in 1932, ask several companies to make an investigation of their heart impairments; in 1933 of albuminuria and glycosuria; in 1934 of the different types of ulcers and so forth. A regular schedule might be followed so that all impairments would be studied over a period of seven or ten years. This would mean that a serious burden would not be thrown on all the companies once in fifteen or twenty years, but that the companies selected would have a program with which the clerical force would be familiar, and which would be carried out in a routine way. The other companies would have means of comparison with the company or companies which had a method of selection nearest to their own instead of with a combination of material obtained from many companies with different types of selection. If such a suggestion were to be considered seriously we should soon commence to make the plans for carrying it out. In putting this program into effect it might be necessary to make a number of modifications in our present plans and it might be difficult to induce the companies selected to undertake the work. All the companies should agree to pay a part of the cost of investigation as the data would be prepared on lines which the Committee desired rather than on the economical lines which the individual companies might prefer to use.

A further suggestion might be made that where the mortality experienced appeared to be out of line with medical opinion or where an anomaly seemed to exist, an analysis should be made by the medical staff of a cross section of the cases in order to

determine whether they came properly within the code perforated on the mortality cards. If it seems desirable to continue to combine the experiences of a number of companies, the time has come when it is no longer feasible to analyze and publish the results within a reasonable time when cards for individual cases are sent to a Central Bureau. If speed were not of prime importance then we could obtain perforated cards from all companies and makes more detailed analyses than we are now enabled to do. There is of course the advantage from receiving such cards that various analyses can be made after the results are obtained, which are more difficult when summary sheets are furnished unless the companies kept their cards segregated until the investigation was completed. I am disposed to think however, that it would be better to obtain summary sheets from companies which have well equipped machinery with data kept up to date. By so doing the labor is divided and the analyses expedited. In the last investigation there were substantial delays due to the fact that the data were furnished as much as six months after the date set and further delays were caused through misunderstandings by an inexperienced force. On the other hand, and it is very important, the effect of inviting all companies to participate has resulted in many of them adopting modern methods for making mortality investigations. I have been assured by a number of actuaries and medical directors that if it had not been for the joint investigations they would not have been able to induce their companies to adopt methods for mortality studies.

TABLES OF HEIGHT AND WEIGHT

A review of the tables for the height and weight indicate that there is no need for further investigations for a number of years on this subject, as the change in weight, according to age and height, from the results of the M. A. M. I. is inconsiderable. While there has been an undoubted increase in height in the last generation among the college type of men, there is no proof of any material change in the relation of weight to height. The Southern Europeans, who later may take insurance in "ordinary"

companies to a greater extent than at present, may have an influence, but probably only to a slight extent.

The other interesting feature of the height and weight table is the difference between men and women. While men of the same height and age weigh more than women, as they present themselves for life insurance, no such difference is found when allowance is made for the lighter shoes and the little clothing which women wear. In fact, it is probable that women in a state of nature weigh slightly more than men at the same build for the same ages.

COMPARISON OF RESULTS WITH COMPANY RATINGS

I recommend all the students to read the statement of the Committee on page 30 under the heading "Comparison with Other Material" and also the last paragraph under "Comparison With Ratings of Insurance Companies". By giving the ratings of insurance companies for the various impairments the reader is enabled to compare the results of the investigation with the opinions of companies as expressed by their ratings. If it be proper for a writer to put into quotation marks his own statements, it is done in the present instant: "The average rating of the companies for the various impairments sometimes differs materially from the results of the present mortality investigation; yet an individual company's ratings may closely approximate to the company's own experience under the impairment in question. It must not be forgotten that comparisons are being made between the total experience of different companies and the average rating of representative companies, not between the individual company rating and its experience."

In the aggregate several of the companies which contributed material to this investigation have found that their mortality has been reasonably close to what was expected, yet it has differed under certain impairments from the results of this investigation. This is to be expected on account of the different methods of selection, or the different point of view of the Officers of the company. The only real comparison, if a company be large enough, is the experience of the company with that expected. Should

that not be practicable then the aggregate experience of the companies is a good guide, assuming that average selection is employed. As comparatively few companies are in a position to make investigations of many groups from their own experience, the next move in the interests of life insurance is the preparation of the composite opinions of the Committee on the same lines as was done after the conclusion of the Occupation Study. There would thus be presented the matured opinions of the leaders in the medical and actuarial professions, after taking account of all the material available, some of which has not been published.

While recognizing the objections to adding together the mortality experience under standard and sub-standard plans, some general information can be obtained in a comparison with the ratings of the companies. It appears, for example, that in the classes dealing with functional murmurs, irregular pulse, history of tuberculosis or hemorrhage of the lungs, asthma and bronchitis, goitre and gall bladder infections, the mortality experience has been more favorable than anticipated if we assume that the company ratings constitute the expected mortality. Other significant groups are those where the mortality was distinctly higher than expected. These comprise three types—heart murmurs, abnormal arterial tension and albuminuria. There is a third classification in which the mortality experience differs from the average company ratings in some but not all sub-divisions. For example, the ratings seem low where tuberculosis of bone or joint had occurred within ten years and high after that time. The general statement may be made with regard to pleurisy that one attack shows a higher mortality than anticipated if within five years but a lower mortality after that time.

EFFECT OF CHANGING CONDITIONS

Unless investigations are made at fairly frequent intervals we shall be unable to determine the effect of changing conditions. The greater knowledge of tuberculosis has, for example, resulted in a lower relative mortality in the new study than was anticipated. On the other hand, the mortality, based on past experience, has

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generally been understated by the companies in connection with heart impairments which may be due to the greater strain under which the business and professional men are now working.

EFFECT OF TWO IMPAIRMENTS

The present study has brought out more clearly than in the past that there are certain impairments which when combined are more serious than if each were considered separately. It seems beyond question that a heart murmur with a history of rheumatism is more serious than the ratings for the two impairments added together. The same seems to apply to albumin with overweight. On the other hand the hazard appears to be less than the addition for the two separate impairments in the case of high blood pressure combined with either a heart murmur or fragile appearance. This unexpected result may again be due to a very rigid selection, as it is highly probable that high blood pressure combined with a heart murmur would be considered of sufficient moment to justify declination of the risk, unless the conditions were unusually favorable.

RATING FOR LIFE INSURANCE, DISABILITY AND ACCIDENT

One of the by-products of the present investigation is that it has brought to light the anomalies which result in the treatment of standard risks when the relative rating is considered the same for life insurance, for disability benefits and for the accidental death benefits. In a discussion with two of those who employed this method the justification was that it was conservative and in many instances that it was just. It is likely that with the increasing knowledge, different ratings will be applied to each of these forms of coverage; as it is generally agreed for example, that, applicants with certain types of neurasthenia, rheumatism, sciatica and neuritis, may have a mortality experience approximately normal, but a morbidity experience distinctly unfavorable.

COMMENTS ON IMPAIRMENTS

One is greatly struck with the difference between the results in the standard and sub-standard cases under some impairments and the practical unanimity in others. Again and again we find unexpected results which could only be explained on the basis of careful selection, as it is inconceivable that, if persons with the impairments in question had been selected from the population, the mortality would have been nearly as good as, or even better, than the normal. In a number of these cases, also, it is quite possible that the impairment did not exist but was merely suspected. If a group of persons had been told that they had a serious defect they would naturally lead a careful life, and if the diagnosis proved incorrect, the mortality would be lower than the normal.

In modern statistical publications the probable deviation is almost invariably given. The Committee followed that course, but in my paper I have omitted it, giving instead the number of deaths. I am afraid my mathematical friends may be surprised at my statement that the more I see of statistics the less I rely upon the probable deviation. I prefer to apply my accumulated experience, sometimes referred to as common sense, in a study of groups where there is likely to be deviation due to insufficient numbers or other causes.

Syphilis

One of the noteworthy features of the report is that the mortality among cases with a history of syphilis is slightly higher among standard than among sub-standard cases. This seems to indicate that it is difficult to select the type of cases which would give a normal mortality. More than one company has tried to do so with unsatisfactory results. In this disease a longer duration of exposure must exist before the effect is known, as the newer treatments may not minimize in later life the diseases which are believed to result from syphilis. So far as this experience goes it indicates a lower mortality than in the period covered by the M. A. M. I. The high death rate from suicide in that and in the present study is significant of the mental effect of the disease on those

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afflicted. In the United States Public Health Bulletin of December 28, 1928, dealing with syphilis, the following statement was made:

"The most that can be said is that the death rate from syphilis, locomotor ataxia and general paralysis has declined 27% from 1900 to 1925."

This should not be taken to mean that the total death rate among persons with a history of syphilis has declined to such an extent.

Articular Rheumatism

One of the interesting groups is that of persons with a history of acute articular rheumatism, of which 80% of those who had not had tonsilectomy were in the standard class with a mortality of 117% (1,096 deaths); the sub-standard mortality was 152%, with 248 deaths. The mortality among the standard risks in which there was a record of operation for removal of the tonsils was distinctly lower than amount the others, but unfortunately the material among the former was small (38 deaths). While this result may be due to a variety of causes, there is at least an indication that the removal of tonsils is beneficial in cases of rheumatism. Furthermore, while the number of cases was small, organic heart disease was not a significant cause of death in the case of those operated upon for removal of the tonsils prior to application, while it was so in the other cases.

In the two large "standard" classes of those who had had one attack and had not had a record of tonsilectomy the time elapsed since the attack had an influence on the mortality, 121% (413 deaths) if within five years of application and 111% (553 deaths) if over five years. The difference in mortality was smaller in the two groups with two or more attacks, 133% and 128% respectively, 65 deaths each.

Neurasthenia

The group of those who had suffered with an attack of hysteria, nervousness, neurasthenia or nervous prostration had a mortality of 98% on cases accepted as standard (675 deaths) and 144%

on those accepted as sub-standard (125 deaths). The mortality, however, of those accepted on standard plans within two years of the attack was distinctly high in a large group with 233 deaths. On the whole the companies were successful in selecting this type of risk. These impairments are of more importance in connection with disability benefits than with life insurance alone.

Infantile Paralysis

Fortunately there was a good sized class accepted as standard among those who had had infantile paralysis (Poliomyelitis) as the significance of this impairment on longevity has not been known. Among those accepted as standard (143 deaths) the mortality was practically normal, while in the smaller class of those accepted as sub-standard (35 deaths), it was 124% which was lower mortality than the companies provided for.

Heart Murmurs, Hypertrophy

Space does not permit me to comment freely on the different types of heart murmurs. The first extensive study of the effect of light or heavy work on the death rate confirms the general point of view of the medical profession. In the large class of constant systolic apex murmurs, transmitted to the left, the mortality was (75 points) higher among carpenters, bricklayers, farmers and others of that type than among those in clerical and managerial service and in retail stores.

The view of earlier investigators that a history of rheumatism with a heart murmur was very serious was fully confirmed. The same type of murmur was selected for this study as for the effect on mortality of light or heavy labor. The mortality in cases with a history of rheumatism was 358% against 180% with other infections. The death rate from organic diseases of the heart was 15 times the normal, whatever the type of infection recorded, and was undoubtedly higher with a history of rheumatism. The companies should raise their ratings substantially for this combination of impairments.

Another feature in connection with hearts was that hypertrophy was of more importance than many underwriters have consid-

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ered. The mortality, for example, under Class 302 with moderate hypertrophy, showed a mortality of 476% (196 deaths) and under Classes 305 and 306 combined, 352% (72 deaths).

Among the cases with heart murmurs, the ratio of actual to expected deaths is very high from pericarditis, endocarditis and myocarditis which in the code were differentiated from organic diseases of the heart. In many impairments the death would be recorded "heart disease" without any opportunity for the physician to make a more exact diagnosis before or after death. In the case of heart murmurs, however, many of the insured had consulted their physicians who, by various tests, had been enabled to differentiate among the various types of heart murmurs. In the preliminary study of the causes of death among persons who took policies for large amounts the high percentage of deaths from pericarditis, endocarditis and myocarditis was apparent, partly due to financial ability of the policy-holders to employ the services of experts who can make such differentiation. As already indicated, the code number for pericarditis, myocarditis and endocarditis is different from that for organic heart disease. I understand that physicians consider the three causes as organic heart disease. In modern vital statistics there is much greater differentiation than formerly, which should be given due weight in analysing the causes of death in this study.

Pulse

The results of the study of pulse rate are surprisingly consistent, combining the data for standard and sub-standard:

Pulse under 55	-	71%
55 - 65	-	82
90 - 100	-	141
over 100	-	155

Care was undoubtedly taken to see that the very low or very high pulse was not due to a serious defect.

In the group of intermittent pulse there was little difference in the aggregate between the mortality under the standard and sub-standard plans, yet the sub-standard data showed a steadily

increasing ratio of actual to expected deaths with the increase in the intermittency—101% under 5 per minute, 131% 5 to 10 per minute and 150% over 10 per minute. In discussions of the Committee some doubt was expressed as to the accuracy of the records under irregular pulse, as, unless considerable care is taken it is not easy for all examiners to determine how often in a minute a pulse is irregular. For all degrees of irregularity the mortality was 90% among the standard and 174% among the sub-standard, indicating that in many cases of the former the irregularity was merely a passing condition.

High Blood Pressure

In some respects the investigation of the effect of high blood pressure is most satisfactory. It proves beyond doubt that the earlier researches of the life insurance companies reflect the conditions with substantial accuracy. Many physicians thought that our action in treating as sub-standard risks persons with a blood pressure of 25mm. above the average was panicky. That was partly due to the earlier conception of an average of 120 mm. at age 20 plus 1 mm. for each age thereafter, giving 140 mm. instead of 130 mm. at age 40 and 160 mm. instead of 135 mm. at age 60. In the Blood Pressure Investigation of 1925 the relative mortality of cases 16 mm. and more above the average was 207% against 202% in the present investigation. We now find that the mortality in the group with 25-34 mm. above the average systolic pressure is 205% and in group with 35 to 44 mm. it is 265%—a clear indication of the sub-standard extra mortality which must be provided for.

Pulmonary Tuberculosis

In considering the results of the three classes under pulmonary tuberculosis there are several factors involved, such as build, age, time elapsed since the attack, severity of the attack, and whether or not there are physical signs. When suitable subdivisions are made the amount of data is comparatively small; in fact, the contradictory results may be largely ascribed to accidental fluctuations from paucity of material. It is not likely that

cases accepted *under like conditions* without physical signs would show a higher mortality on standard risks than under cases with physical signs at date of examination, or where no statement was made by the examiner as to these signs. Combining the three groups (a) not specified as to physical signs, (b) with physical signs, (c) without physical signs, the mortality on standard cases was better than normal, which indicated that the applicants were of good build, and that a number of years had elapsed since the attack.

On sub-standard cases the mortality for all groups combined was 151%,—a better experience than the companies expected, as shown by their ratings. When sub-divided by weight, the mortality in the standard sections was too small to give reliable results,—only 9 deaths in the underweight, and 7 in the overweight groups. As expected the mortality in the underweight group on sub-standard cases was higher than in the average weight group but the results might have been reversed if the average time elapsed had been fifteen years on the former and seven in the latter. That there was a hazard from tuberculosis is indicated by the fact that the death rate from pulmonary tuberculosis was from four to five times the normal in the three classes, and in the combined classes there was a similar relationship for other forms of tuberculosis.

With regard to hemorrhage of the lungs, the mortality was better than the normal (70 deaths) in the standard class, and 166% in the sub-standard class, with only 30 deaths. No conclusion could be drawn from the division by weight as the material was scanty.

Asthma

There was added to our knowledge of asthma a goodly volume of material, showing that a history of that disease had resulted in a mortality of 233% (238 deaths) in the sub-standard group and 112% (212 deaths) in the milder types accepted on standard plans. The death rate from organic diseases of the heart was high. This is to be expected, as in asthma of long duration the heart is likely to be affected. It may also be that in certain

cases asthma was secondary and was a symptom of a heart lesion which was not found by the medical examiner.

Bronchitis

Unfortunately the material on chronic bronchitis was rather slim, so that little indication could be determined of the effect of weight in this disease. However, there was added to our store of knowledge the fact that the cases accepted on the sub-standard plans showed 178% mortality (72 deaths), and on the milder types on standard plans 101% (44 deaths). The death rate from tuberculosis and from pneumonia was distinctly higher than the normal.

Pleurisy

In the large class with a history of dry pleurisy the mortality was 142% (274 deaths) for those accepted on standard plans with a death rate from tuberculosis of three times the normal and from pneumonia of twice the normal. Among the cases of pleurisy with effusion three-quarters of the material consisted of those with a history within five years from date of application for insurance. The ratio of actual to expected deaths was 225% (109 deaths) with a very high death rate from tuberculosis of the lungs, six times the normal. A recent medical analysis of cases of pleurisy with effusion indicated that about 48% of the group developed active tuberculosis within five years. I am inclined to think that our treatment of cases with a recent history of pleurisy with effusion is too lenient. In the group with a history of purulent pleurisy the mortality was 95% (83 deaths) in the standard cases and 150% (52 deaths) in the sub-standard risks. An endeavor was made to differentiate according to the length of the attack in the group of "Pleurisy no details" which may not be a homogenous group. The mortality was distinctly lower among those with a history of an attack of less than two weeks than among those with a longer attack. The mortality of the former among standard business was 118% (116 deaths) and of the latter 151% (108 deaths), both among risks accepted within 5 years of the attack. The corresponding ratios were 106% (67

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deaths) and 131% (70 deaths) where the attack occurred within six to ten years from the date of application. This indicates that the time elapsed since the attack was a material factor, the further from the attack the lower the mortality.

Gastric and Duodenal Ulcers

It is unfortunate that there was not in the investigation a larger group of persons with a history of gastric ulcer. The mortality among those accepted as standard was satisfactory, but is the low mortality due to fluctuations among small groups or to the substantial number of years elapsed on the average since the attack or operation? In the larger sub-standard groups the mortality was 171% (58 deaths) among cases not operated upon and 206% (97 deaths) among those who had an operation. At one time it was considered that an operation indicated a much more serious condition than medical treatment, but is this so today? Is this not one of the types of impairments in which the changing medical and surgical practice discount statistics based on the results of the last twenty years? There are two significant features of the report namely the high death rates among the sub-standard risks from ulcer of the stomach and from cancer.

Combining all cases with a history of duodenal ulcer irrespective of duration since attack or operation and irrespective of whether accepted as standard or sub-standard, the mortality was 153% (55 deaths) without operation and 146% (84 deaths) with operation. This seems to confirm the present practice of the companies in treating both types alike.

Biliary Colic, Gallstones

In the combined group of biliary colic, gallstones without operation and infected gall bladder without operation, the mortality for the entire class 109% (208 deaths) indicates that such cases might be accepted as standard risks after a reasonable time has elapsed since the attack, with no sequelæ. It has been suggested that the satisfactory mortality may be partly due to including some cases of indigestion as bilious colic, although indigestion itself is a symptom and should not be confused by capable physi-

cians, with bilious colic. Where the gall bladder was removed, no stones being found, the mortality was 98% (88 deaths) among the better type accepted as standard risks and 121% (28 deaths) in the small group of less favorable cases. In the large group of cases with a history of drainage of the gall bladder, accepted on standard plans, the mortality was 135% (161 deaths). If our statistics are later confirmed it indicates either that the cases of drainage represented a more severe type than those with a history of gall bladder removal or that the former operation is not so successful permanently as the latter.

Fistula

The only comment which I shall make on fistula in ano is to question a coding which does not take account of the nature of the fistula, its extent and its duration. More differentiation should be employed.

Albuminuria

Studying first the cases accepted as sub-standard, the following are the results:

	Deaths	Ratio to Expected
Intermittent, trace	194	129%
Intermittent, moderate amount	39	150
Constant, trace	492	173
Constant, moderate amount	200	174
Constant, large amount	70	298

The apparently inconsistent result in the foregoing is that the mortality in the large class of a constant trace of albuminuria is practically the same as for a moderate amount. It may be that the same standards were not always applied in all companies. Prior to the sulpho-salicylic acid test the difference between a trace and a moderate amount was largely a matter of individual interpretation and may still be where this test is not used.

In the standard section the mortality of 99%, with 65 deaths, among the cases with an intermittent trace is to be expected, but the mortality of 102% with 81 deaths with a constant trace of albumin was better than the impairment would indicate.

In the group of cases with constant albumin the death rate from Bright's disease is quite significant, rising from $5\frac{1}{2}$ times the normal with a trace and $7\frac{1}{2}$ times with a moderate amount to 22 times with a large amount.

The research into albuminuria with overweights seems to indicate that the combination of these two impairments represents a greater hazard than shown by the addition of the two ratings. In the group of combinations of impairments there was a high mortality in the sub-standard section with a constant trace of albumin, with blood pressure of 10 mm. or more above the average. There were 174 deaths with a mortality of 282% whereas in a similar group, but with blood pressure normal, that is from 9 mm. under to 9 mm. over the average, the mortality was only 139% with (216 deaths).

Casts

There was a large group of cases accepted in the standard class with casts, showing a mortality of 96% with 555 deaths, against the average company rating of about 115%. Theoretically, this is a heterogeneous class as it covers hyaline casts and granular casts, whether intermittent or constant. Practically, the cases were very largely in the group of hyaline casts. Furthermore, the great majority of the material in the standard group came from one company which makes a greater proportion of microscopic examinations than is customary. "Casts were therefore detected by this company in a great many cases which would be accepted as standard by other companies without any record of casts having been noted." While it is likely that normal mortality may be obtained by a careful selection of risks with intermittent hyaline casts, most companies would feel it advisable to provide for an extra mortality in the case of either constant hyaline or granular casts.

Glycosuria

The large groups are those accepted on standard plans in which the amount of sugar was not specified or in which it was found in only one specimen. As stated by the Committee, a glycosuria. It is probable, that on the average, three or four tests

of the urine were made, only one of which showed the presence of urine were made, only one of which showed the presence of sugar and that in other respects the applicants were first class, otherwise they would not have been accepted on standard plans. The mortality was 98% (219 deaths) where the accidental finding of sugar was on the examination for insurance, and 113% (392 deaths) where there was a history of such finding within two years. This difference may be explained on the ground that the selection was less stringent when there was a history with no trace of glycosuria on the new examination than if a defective specimen were found on application for insurance. In spite of the favorable mortality, which was only a trifle above the basic table for both standard and sub-standard cases combined, the death rate from diabetes was $5\frac{1}{2}$ times the normal, a clear indication that some of the applicants with what appeared to be an accidental finding of sugar, really had the beginnings of a permanent and serious condition. In the sub-standard group of applicants with intermittent sugar of not more than 1%, who had not adopted a restricted diet, the mortality was 122% (69 deaths) and in the corresponding group with persistent sugar it was 165% (49 deaths). The death rate from diabetes was very high. I am inclined to think that an endeavor was made in these two groups to apply modern tests in order to eliminate the poorer type of applicants. We shall know much more about the subject, however, when sufficient time has elapsed to investigate the record of cases now being accumulated under which blood-sugar and carbohydrate tolerance tests had been made.

Renal Colic

There is a large class of cases with a history of renal colic, accepted as standard. Where there was one attack, without operation, within two to five years from date of application, the mortality was 85% (225 deaths) and within six to ten years 92% (176 deaths), but when there were two or more attacks within ten years the mortality was 131% (105 deaths). Evidently any additional hazard which resulted from one attack was offset by a careful elimination. It is curious, however, that the mor-

tality in the last mentioned group on sub-standard risks was 100%, which may have been due to accidental fluctuation (43 deaths). Taking all cases accepted as standard, the mortality was 94%, and as sub-standard 102%. Where there was an operation the amount of material was small, 41 deaths with 128% mortality on standard plans, irrespective of the number of attacks or time elapsed since the attack, and 52 deaths with 187% mortality on the sub-standard plans. It is clear that the cases in which there have been an operation were more serious than those without operation which may be expected, as in the operated cases there was probably an impaired kidney which may have been further damaged by the operation. An interesting feature is that in the cases with operation the death rate from Bright's disease was four times the normal, a similar result having been found in the M.A.M.I.

Blindness

In the case of blindness of one eye the mortality in the large group accepted as standard was 110% (256 deaths), and in the small group of total blindness accepted as sub-standard it was 157% (36 deaths). In the former, the death rate from accident was $1\frac{1}{2}$ times the normal, while in the latter there were no deaths from accident. The class of persons with total blindness was small so that little significance can be attached thereto. The company which could have supplied probably more material on cases of total blindness than all other companies combined, did not participate in the investigation. It is unfortunate that we do not have more information on this line as our sympathy would lead us to treat persons who are totally blind as leniently as possible, and as we are constantly urged to grant them insurance at the regular rates of premium on the ground that they are less liable to accident than persons with normal vision.

Deafness—Mutism

The large class of marked or total deafness shows a mortality of 99% in the standard and 127% in the sub-standard group. We should like to assume that the former contained

persons who are markedly deaf and the latter those who are totally deaf, but it is likely that some of the best of the latter appear in the standard class. The results seem to justify the companies in treating persons who are totally deaf as sub-standard risks.

With regard to those who are mutes there seemed to be a difficulty in the minds of the laymen in differentiating between them and deaf mutes. The combination of the two classes gives us little material. This is unfortunate as our sympathies would lead us to treat with as much leniency as possible those thus afflicted. At least one company is satisfied that mutes or deaf mutes are entitled to insurance at the regular rates of premium and those in charge of the various institutions feel that there is no reason to discriminate against those who are mutes through deafness from birth.

Appearance fragile, not robust

In the large group, with 200 deaths, accepted on the sub-standard plan, the mortality of 157% confirms the work of previous investigators. The group accepted on the standard plan, with 55 deaths, showed a higher mortality, 169%, than those accepted on sub-standard plans. It is evident that this class needs careful study by those charged with the selection of risks, especially as the death rate from tuberculosis was four and a half times, and from pneumonia twice the normal.

Simple Goitre

An endeavor was made to differentiate between a small and a medium sized goitre. In the class accepted as standard, without operation, the mortality was better than the normal among those with a small goitre (156 deaths), and also better among those with medium sized goitre (34 deaths). In fact, there was no group in which the mortality was markedly above the normal, if no operation had taken place. In the cases of simple goitre with operation the sub-divided groups were too small to enable us to draw any deductions except that, on the whole, the cases of

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goitre with operation were somewhat more serious than those without operation.

CONCLUSION

In the course of the investigation there were many occasions on which additional information was required, which could not be foreseen when the plans were prepared. On behalf of the Committee I wish to thank the various companies for their wholehearted support in obtaining such information, sometimes at considerable inconvenience to themselves. For example, as there was some doubt with regard to the normal pulse rate, especially among women, three companies each prepared their records on 10,000 applicants. Several companies also assisted in comparing the mortality by policies with that by amounts insured and in examining death claims under a number of impairments, such as syphilis, epilepsy, papilloma, asthma, biliary colic, albumin and casts, in order to gain a better insight into the nature of the material under investigation.

Actuaries are apt to neglect statistics issued by health authorities and by clinics, basing their practices largely on their company's experience or on the results of collective investigations. There was reason for this point of view in the past, but there has been a great improvement in the accuracy of vital statistics and in the training of men preparing them. There has also been a great change for the better in the reports published by physicians, surgeons and clinics. The wealth of material of this nature should have serious attention, as in many instances it forecasts changes which our statistics have not yet indicated. Medical opinion should also be carefully considered in interpreting our statistics, as allowance must be made for radical changes in the treatment of diseases which were not in effect during the main period of our investigations.

In conclusion I should like to add that the deductions from the new study were more difficult to make than those from the statistics of the M.A.M.I., principally due to the varying methods of selection. The suggestion at the beginning of this paper that

separate investigation be made of individual companies' experience is largely to eliminate errors which may arise from basing our conclusions on collective material. The day of combining the data of many companies has not passed, but in the interim between joint investigations the experiment suggested by me might give fruitful results. Where there is a scarcity of data it would still be desirable to have most of the companies give their experience.

SUPPLEMENTARY NOTE ON BLOOD PRESSURE.

Prepared by Dr. Arthur Hunter after presentation of the foregoing Paper.

In my paper on "Comments on the Medical Impairment Study (1929)" I stated that the high mortality among the three groups of abnormal blood pressure, especially the first group, was due partly to the inclusion of cases with histories of various impairments. In the group from +5 to +15 mm. above the average the mortality of 153% could not be solely due to such a moderate degree of blood pressure in excess of the average. To obtain more light on this problem, an investigation of 300 cases insured in the New York Life Insurance Company and included in the M.I.S., was made and also of 300 cases with a blood pressure of from 16 to 24 mm. above the average. These cases were all taken from policies in existence at the end of the observations, so they would represent a better type than among the deaths and were obtained from the records of successive policy numbers for groups of one hundred each. The following were the results:

An Analysis of cases accepted as Sub-standard Risks and included in the M.I.S. 1929.

History of	Systolic Pressure	
	+5 to +15 mm. above the average	+16 to +24 mm. above the average
	Percentage to	Total Cases
Heart Murmur	8	7
Albuminuria	8	9
Abnormal pulse	7	9
Glycosuria	5	3
Casts	5	6
Overweight of 15% or more	5	3
History of high blood pressure	41	35

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There was occasionally a history of two impairments which has not been recorded separately in the foregoing table. It is significant that in 35% of the first and in 27 of the second group there was a variation of 20 or more mm. between the highest and the lowest systolic pressure, taking into account former records of blood pressure readings. It may also be stated that in over 30% of the cases in both groups the diastolic pressure was 100mm. or more.

It is apparent from the foregoing that the cases were treated as sub-standard on account of their previous history as well as on account of their present condition.

To add to our information on the subject it seems desirable to make a mortality investigation of cases accepted as standard risks. There would be very few accepted on standard plans with 25 mm. or more above the average, and accordingly the other two groups only were taken, but there were added for the purpose of comparison two other groups,—(a) from 4 mm. over the average to 4 mm. under it and (b) from 5 to 15 mm. under the average. All the cases were taken from the issues of 1916 and the observations carried to the policy anniversaries in 1930. The Insured were men born in the United States. The study is by policies. The results are as follows, a special mortality table having been prepared to determine the expected deaths:

Departure from Average Systolic Blood Pressure	Actual Deaths	Expected Deaths by Company's Standard	Ratio of Actual to Expected Deaths
-15 to - 5 mm	349	401	87%
- 4 to + 4 mm	396	394	101
+ 5 to +15 mm	481	422	114
+16 to +24 mm	59	46	128
Total	1,285	1,263	102%

With regard to the group of +16 to +24 mm. it may be mentioned that the standards of selection in cases of high blood pressure have been stiffened since 1916 so that many of the cases then accepted at standard rates would now be charged an extra premium.

The low mortality in the group of those distinctly under the average blood pressure is in accordance with expectations. As stated by me eleven years ago I seriously question whether the average blood pressure may be designated as the normal.

Combining the material into two groups, the following are the results by ages at entry:

Departure from Average blood Pressure	Actual Deaths	Expected Deaths by Company's Standard	Ratio of Actual to Expected Deaths
-15 to + 4 mm. Ages at entry			
15 to 39	391	395	99%
40 to 49	232	256	90
50 & over	122	144	85
	<hr/> 745	<hr/> 795	<hr/> 94%
+ 5 to +24 mm. Ages at entry			
15 to 39	202	192	105%
40 to 49	200	159	126
50 & over	138	117	117
	<hr/> 540	<hr/> 468	<hr/> 115%

While too much reliance should not be placed on the incidence by age in the above synopsis, it is interesting to note that the highest relative mortality in the group of those 5 to 24 mm. above the average is the same as among the sub-standard risks in the M.I.S., namely at group ages 40 to 49.

It may be mentioned that the cases which had been treated as sub-standard by the Company on account of other warnings than the high blood pressure at the time of examination had a higher mortality than for all companies combined in the M.I.S. The cases accepted as sub-standard therefore show a markedly higher mortality than among those accepted as standard with the same departure from the average blood pressure. The same wide difference may not exist in other companies and accordingly the results now published should not yet be considered as conclusive.

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DR. KNIGHT—It is very rarely that one has an opportunity to praise an important piece of work such as we have here in the Summary of this latest Medical Impairment Study prepared by Dr. Hunter; or, rather, it would be rare indeed if this one man, of whom we have grown to be so fond and in whose wisdom and foresight we have such confidence, were not still in such good health and so actively at work with us. One can confirm and applaud almost every point that he makes in this extremely important contribution. Dr. Hunter's observations are as valuable in their bearing upon the future conduct of our experience studies and for the rationalization of insurance medicine as they are in wholesome criticism of past results.

His suggestion that in further studying the experiences of companies doing only standard business and of those doing both standard and sub-standard business be segregated is both startling and important. I believe that it will be well worth while to do it and thus gain further insight into the results of uniform selection by the various member companies, but I see no reason why those results from both the large groups should not later on be pooled so as to furnish more abundant material for the studies. And, after all, there must be as great differences in data between various companies doing both standard and sub-standard business as between those doing only standard and those doing both.

I am particularly impressed with the value of his suggestion that in the future the investigations into impaired risks be a continuous rather than a sporadic procedure. If this suggestion of Dr. Hunter's is acceptable, it will have the effect of stimulating interest in these investigations in a great many companies, and we shall in that way increase the amount of information available and sustain actuaries, medical directors, and others of each of the companies in their own experiences. In that way it will be possible to see what happens after specific methods and approaches have been under way in the several companies. Heretofore, we have wiped out differences more or less by merging the experiences of diverse sorts. The effect of Dr.

Hunter's suggestion will be to show sharply wherever we can what each company has experienced as the result of some specific policy that that one company had adopted. The experimental method in life insurance medicine, with rigid and informing control, should be given a hearing.

To a certain degree, what Dr. Hunter has suggested has already been in operation in a number of companies. We have all thus been greatly indebted to him and to Dr. Rogers for the splendid series of pioneer investigations which they initiated and which over long periods of years have made medical history in the life insurance business. This, too, is a good occasion for recalling the memory of Brandreth Symonds, Elias Marsh, and the other Medical Directors of the Mutual Life, and those outstanding men of the other companies like Holden and Shepherd, who took their material seriously and made valuable contributions. And perhaps it is not immodest of one coming from the Metropolitan to say a word with regard to the series of studies made in that company and the methods developed over the last two decades on various impairments, including albuminurias, glycosurias, pleurisies, and specific heart impairments, and others of a similar nature which have been subjected to analysis to the benefit of the business.

Those of us who have been connected with the larger companies where there has been an ample supply of material, and a will to make these investigations, know how valuable Dr. Hunter's suggestions are when he says that more and more of the companies should do this very thing. The larger the company, of course, the more certain the possibility of getting results that are worthwhile. Nor is there any loss later in pooling tabulated and properly compiled experiences, because we can then see what the effect of the inclusion of any one large company adopting experimental practices is on the total.

To illustrate how variable the experiences of the individual companies may be, I think it may be of some value to put into this record a table showing the comparative results of certain studies made in the Metropolitan with those of the aggregate of the companies as reported by Dr. Hunter in his paper.

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This table shows, for example, under such headings as pleurisy, heart findings, etc., wide discrepancies in some results, and in some cases amazing similarities. But, nevertheless, there is food for thought in the divergencies which this table discloses. I have no other explanation for the diversity in findings except that over a period of years those directing the policies in one company developed attitudes and procedures which crystallized in experience and which gave results different from those of other companies following approximately the same principles of selection.

RATIOS OF ACTUAL TO EXPECTED MORTALITY OF RISKS WITH SPECIFIED FINDINGS. COMPARISON BETWEEN EXPERIENCE OF METROPOLITAN LIFE INSURANCE COMPANY* AND THAT OF THE MEDICAL IMPAIRMENT STUDY, 1929.

FINDING	Percent Ratios of Actual to Expected Deaths		
	Metropolitan Experience* A.M. Select —100%	A.M. Select*** X1.25	Medical Impairment Study** Basic Table 1909-1927
Pleurisy, all classes			
Standard, total	89	111	133
Pleurisy with effusion	106	133	139
Dry Pleurisy	86	108	142
Pleurisy, no details, total	89	111	126
Short attack within 5 years.....	98	123	118
Short attack 6 years or more..	84	105	106
Long attack within 5 years.....	103	129	151
Long attack, 6 years or more..	85	106	131
Sub-standard, total	129	161	202
Heart findings, sub-standard only			
Systolic apical murmurs, total.....	220	275	231
Without hypertrophy	214	268	216
M u r m u r constant and/or transmitted or specified as mitral regurgitation (code classes 302,303,306)	231	289	229†
Murmur constant but not transmitted or without de- tails (code class 301)	185	231	156
Murmur inconstant or speci- fied as functional (code classes 304 and 305)	95	119	137††
With hypertrophy	300	375	278
Mitral stenosis	378	473	553
"Aortic stenosis"	156	195	259†††
	—	—	131††††
Intermittent or irregular pulse	145	181	135

*The Metropolitan experiences are based on the following data:—

Pleurisy—Issues of 1918 to 1924 carried to April, 1927. Short attacks are those lasting less than THREE weeks; long attacks, THREE weeks or more. The totals each include a small experience on cases with deficient details regarding time and/or length of attack.

Heart findings—Issues of 1918 to 1927 carried to the anniversary in 1928. Special Class A, only. Data on systolic apical murmurs and on intermittent and irregular pulse are limited to white males only. The three groups into which the mitral regurgitation cases are divided do not represent exactly the code classes following them, but are the closest approximation we could make for cases coded by us prior to 1925. Aortic stenosis includes classes 309-312.

**The Medical Impairment Study includes the available experience on issues 1909 to 1927 carried to the anniversary in 1928. The following notes regarding the material used in this table are pertinent:

Pleurisy—Short attacks are those lasting less than TWO weeks; long attacks TWO weeks or more. The experience is limited to attacks occurring ten years or less before application.

Heart findings—The experience used here relates only to sub-standard cases.

***This column gives roughly approximate ratios of actual to expected mortality by the new Basic Mortality Table.

†Includes experience on code class 305.

††Excludes experience on code class 305.

†††Experience on code classes 309 and 310.

††††Experience on code class 309, only.

Independent investigations by the Metropolitan of its experiences with heart conditions were made in 1918, 1926, and 1929, with the result that favorable experiences on functional heart murmurs and irregular pulses were recognized and the ratings made more liberal. At the same time the high mortality among the cases of mitral regurgitation with hypertrophy led to higher ratings. Thus, instead of being surprised and alarmed at the high mortality ratios of risks with mitral regurgitation reported in the 1929 combined study, we are satisfied, because recent studies of the Company's own experience have shown that the mortality of male risks of this type insured by us from 1918 to 1927 and traced to the policy anniversary in 1928 was 220% of the expected on the basis of the American Men Select and Ultimate Table. This is roughly equivalent to 275 per cent. of the new Basic Mortality Table. But it was only 70 per cent. of the Metropolitan Special Class Table. Cases where there was evidence of hypertrophy showed a mortality 300 per cent. of the American Men Table, which is roughly equivalent to 375 per cent. of the new Basic Mortality Table. The mortality of this group too was within our Special Class Tables, although fairly close to the limit. Analysis showed that the younger risks were responsible for the excessively high mortality in this class and this analysis formed the basis of one of the new ratings.

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What intrigues me, however, more than anything on this occasion is the hope that Dr. Hunter throws out for the future. He sets up the constructive idea for more studies along these lines, made not occasionally as we have done in the past, but as a current proposition through the increased interest of the individual companies. Are we facing the renaissance of life insurance medicine? Dr. Hunter's views, and those of others whom I have consulted, suggest that we are on the verge of a new effort which will eventually, I hope, place life insurance medicine in its rightful place as one of the pillars in the arch of insurance science in America. But, if we are to do this, I believe we should give very careful thought to planning the technique of the procedures which are necessary to assure a comparability between the several companies and validity of the material itself. That technique is already developed in the works of scholars in medical and vital statistics, and awaits only our word to make it applicable to our needs. I am a little hesitant to say this, because it might appear that I was slurring over or minimizing the value of the past work. But my thought is quite the contrary, for it has been of monumental value. I believe Dr. Hunter will agree with me that every precaution should be taken in the future to obviate those difficulties which he recognizes, and repeatedly mentions, better than any one, in his discussion of this material in the 1929 study.

I have in mind a new deal with regard specifically to the code of medical impairments which I am convinced can be greatly improved as an instrument for these future studies. I need hardly say that originally this code was conceived for the purpose of the previous record classification. For that purpose, it served admirably and continues to do so. But it is one thing to be that red flag of warning about questionable risks and quite another to use the same classification for so delicate an instrument as the study of definite impairments and their subsequent mortalities. For such a purpose I believe it is necessary to do exactly what Dr. Hunter implies in certain sections of his paper, and that is to take advantage of the advances that have

been made in classification procedure, in medicine and in the science of vital statistics, and to call in those for consultation who have been at work in this field for many years and to whom problems in the specialty of medical statistics are their primary function. I believe we can profit very much indeed from such new conferences and associations. Some companies are already doing it to their profit. I need not clutter the record with specific instances, but, if it were desirable, I could list any number of impairments, as we have been studying them, which are subject to very severe criticism, because the coded records do not give us medical entities, because they do not give us sufficient information descriptive of the impairments, whether severe or otherwise, the number of attacks, or the duration of the periods between the attacks, and other items of this sort, which, if they were available in the classification, would make our groups much more perfect and the results much more satisfactory.

Again, we are devoutly thankful that Dr. Hunter is still with us and that he continues to be so generous in the frequency of his coming to us with his masterful papers.

DR. CAMPBELL—One cannot but be impressed by many unexpected results to be noted in this study. The majority agree with previous studies and are further substantiated by medical judgment. There are some groups in which the results cannot be accepted at their face value without question. For example—moderate users of alcohol, a history of syphilis, renal colic, rheumatism and nephritis all give a surprisingly high mortality at the younger ages. The first three particularly heretofore have not been considered to be more serious at the younger ages. As a matter of fact some companies' ratings provide for more severe penalties at the older ages. While the figures may be accurate at least the reason for this unexpected result is not apparent. Should we accept the results as final and positive or should we search further—verify the findings and seek a rational explanation.

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Fistula in ano is a group which seems to demonstrate the great value of a study of this type. The hazard of fistula has been considered directly related to tuberculosis as the etiological factor. The relation of tuberculosis to fistula has long been a subject of violent controversy. Opinions vary so widely that the incident of tuberculosis as the cause has been estimated by various physicians from 1% to 70%. The average estimate by conservative men is about 10%. A review of the literature shows that 4,160 patients were admitted at Trudeau between 1909 and 1927, of these 21 had fistula. Dr. Buie reports that of 9,668 cases in 10 leading tubercular hospitals 264 had fistula. Dr. Fansler reports 891 cases and only 5 had fistula. While long associated with tuberculosis certain it has not been proven as the predominating etiology. This would seem to be verified by the study in which we have a large group of over 59,000 accepted standard with a mortality of 103%, combining the standard with the small sub-standard group gives an average of 106%. The results seem to indicate that the clinical opinions are too severe and that the hazard of fistula has been greatly over-estimated.

Empyema, also, has borne the stigma of having been associated with tuberculosis when as a matter of fact pyogenic infections are the etiology in the vast majority of cases. When tuberculosis has been definitely ruled out, why can't empyema be considered an abscess and when healed for a reasonable length of time no sequelæ is to be expected except that due to residual lung damage. Tuberculosis if not the etiology is not expected to be a secondary invader. The study supports the view of liberal treatment in spite of the fact that tuberculosis was the leading cause of death. That the selectors were able to adequately gauge the severity of the impairment is demonstrated by the fact that the standard group gave a mortality of 95% while the smaller sub-standard group gave a mortality of 150%.

We should not be surprised at the adverse results demonstrated in pulmonary impairments other than tuberculosis, nor in tuberculosis other than pulmonary. It is to be expected that

unsatisfactory lungs (411x) and chronic bronchitis would show a high death rate from tuberculosis and the companies' ratings which appear adequate are justified. It has been the custom to treat all blood spitting as tuberculosis unless definitely proven otherwise, and the removal of blood spitters from the tuberculosis group has been done cautiously and with great reluctance. Therefore, isn't it a bit inconsistent to treat so liberally pleurisy with effusion when it is as often and certainly tuberculosis as is blood spitting? As a matter of fact pleurisy with effusion gives a worse experience than any group of pulmonary tuberculosis. It is logical clinically and supported by the study to treat pleurisy with effusion exactly the same as pulmonary tuberculosis.

In contrast with fistula in ano and empyema, which have borne the stigma of tuberculosis, perhaps unjustly, take tuberculosis of the bone which has received such surprisingly liberal treatment. If the history is recent it gives a worse mortality than any group of pulmonary tuberculosis. Since tuberculosis of the bone is secondary usually to a pulmonary infection, common sense would indicate that multiple tuberculosis cannot be other than more significant than a single infection.

The contrast between pulmonary diseases and blood pressure is worth noting. Pulmonary diseases are usually a single impairment and if other significant impairments are present, this material is not included in the study. The results obtained are reasonable and are confirmed by clinical judgment. Now take the blood pressure group—classified as "Abnormal arterial tension found on examination, 5 to 15 mm. over the average systolic pressure."

Let us assume that all are 15 mm. above the average. Adding this to the average you have at age 20—135 mm., age 30—137 mm., age 40—140 mm. age 50—144 mm. Note that this is a group of over 34,000, all sub-standard, giving an average mortality of 153%. The worst experience is in the largest group between the ages of 40 to 49 being 179%. Past practice has not been to consider as sub-standard a blood pressure of 135

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or 140 at most adult ages. At age 50 very few with a blood pressure of 144 have been considered sub-standard. Therefore why this large sub-standard group? What led the selectors to so classify them? They are sub-standard because of some other factor—not appearing in the study. It is the combination that gives the adverse experience and should not be attributed to the blood pressure alone. A review of the losses of our contribution to this study confirms this opinion. It was found that many fell in this group through the habit of averaging one very high reading with two or more low readings. Others had a history or a previous record of high blood pressure, albuminuria, casts or heart murmur. Therefore those showing a simple moderate rise of blood pressure with a negative history cannot be compared to others with the same pressure who have a significant past history. Furthermore, please note that no study has been made of those accepted standard, which should be by far the greater number. It appears probable that the ones studied represents those selected as the worst and hence naturally an adverse experience—therefore it would be unfair to use this result as a basis for future ratings without including the results of the standard material.

There is no doubt concerning the great value of this study and it is not a severe criticism that some of the results may be the subject of differences of opinion. In handling such a great mass of material it is impossible to give as much attention to details as would seem desirable. For this reason the suggestions of Dr. Hunter concerning future studies would offer an opportunity for more careful investigations. The material at present is gathered from the previous record codes which were revised in 1924 so as to make them applicable to mortality investigations. Our experience with these codes, however, has shown that under certain conditions changes should be made as they do not give complete information. Generally the use of the previous record code is satisfactory for mortality investigations, but there may be instances, such as blood pressure, where there is a history of some other impairment, which may re-

sult in misunderstanding. Since the original source of the material is the very foundation of the work, wouldn't it be worth while to consider devising a new code for purely Actuarial purposes? Such a code could be easily adapted for previous record reports without loss of value for this purpose. If the individual cases are coded by the selector for Actuarial purposes at the time of issue, not only would you have the reasons for the selector's action but would have the benefit of skilled workers insuring greater accuracy than can be secured by later revisions, even if done by well trained clerks. Results that are out of line with current medical opinions should receive careful analysis—not only to eliminate the possibility of error but to demonstrate definitely the reasons why previously conceived opinions are wrong. Our review of the losses in the blood pressure group previously mentioned proved to be a fruitful source of information and gave a logical explanation for an unexpected result. In future studies it would seem desirable to make careful analysis of all losses, to demonstrate that the experience in a large part actually was due to the alleged impairment and not to some unknown factor.

DR. WEISSE—I thank Dr. Rowley very much for the opportunity given me to express my appreciation of Dr. Hunter's very able summary of the report of the Joint Committee of the Actuarial Society of America and the Association of Life Insurance Medical Directors in the Medical Impairment study of 1929, which is of great interest and value. I sincerely hope that these studies will be continued as time goes on, either by the Joint Committee, by individual Companies or by groups of Companies selecting along the same lines as suggested by Dr. Hunter in his remarks. Dr. Hunter's suggestion did not appear in the summary as it was printed, but his thought of grouping the Companies with reference to the type of business they do is a very excellent one and I think results would probably be more uniform for the different groups of Companies.

I thoroughly agree with Dr. Hunter in his advice that when we experience an abnormal variation in mortality in a class, an

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analysis of cross sections of such a class should be made to determine whether or not the risks come properly within the code perforated on the mortality cards. I would suggest, also, that when such abnormal variations occur, a particular study of the death claims be made to determine whether or not the defunct policy-holders should have been originally included in the class in which they appear. This I have found particularly valuable by personal investigations within the last few years.

Dr. Hunter's suggestion that investigation should be made at as frequent intervals as possible with reference to the changes in knowledge and treatment of certain diseases is an excellent one, especially for the Companies doing no sub-standard business. Such investigation should go fully into the clinical progress made both medically and surgically in the treatment of various conditions, and the changing results obtained by such a progress.

One of the groups, for instance, in which clinical study is progressing steadily, and which will undoubtedly be of great value to those engaged in the selection of lives, is the group of glycosurias and diabetics. I feel quite sure that within the next few years a careful study of the clinical reports of some of the men who are now working on these diseases may enable us to make some changes in our present methods of selection.

Dr. Hunter does well to call our attention to the improvement in vital statistics and in the records kept by doctors, clinics and hospitals, for these will undoubtedly be of great value to us in the future. From our point of view of individual selection the study of the general clinical results and the facts in the clinical history as brought out in the individual examination are of great value.

I was interested to find how close our own experience was to the experience of the standard companies to which Dr. Hunter refers in his second paragraph—6% above the average. Our actual experience by policies in the groups covered by the Medical Impairment Study, in which we had 50 or more entrants, was 106.5%, which comes very close to Dr. Hunter's figures. For this reason I have no real discussion to offer as

to the results of the investigation of the standard classes by the Joint Committee. We feel that our results have been obtained by our endeavoring to select only the best of the individuals presenting themselves with an impairment.

One of the very interesting things to me in the report is the conclusion arrived at as to a lack of material variation in weight between men and women of the same height after due allowance for difference in clothing. I have, as many of you know, taken a great deal of interest in the question of height and weight and am much surprised at the facts brought out by this study.

I am also surprised at the excellent mortality shown by the nephrectomy group and will be much interested to follow them further as we have never before felt that an individual with but one kidney came properly within standard limits—they must have been very carefully selected. I think that this group must have been as carefully selected as the one the late Dr. Dwight reported many many years ago, which gave some years experience in cases accepted with quite a large amount of sugar present at time of examination, where the mortality turned out to be better than the general mortality of his Company.

Dr. Hunter's "Comments" give a general idea of the results of the Study and the suggestions he makes are worthy of most serious consideration.

I would like to move a vote of thanks, if it is in order, from the Association of Life Insurance Medical Directors of America to Dr. Hunter and his colleagues on the Joint Committee for their untiring labors in our behalf.

DR. HUNTER—I appreciate very greatly the time which has been taken by busy men to discuss my paper. Suggestions have been made that the code should be changed, and there is also the implication that it was intended solely for giving danger signals rather than for preparing mortality investigations. The fact is that in 1923 a revision was made by the Joint Committee on Mortality and published in 1924. At that time the members of the Committee had strongly in mind the necessity of a code

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which would be satisfactory for mortality investigations, as the companies intended to change their codes for mortality purposes. The desire for further differentiations and new definitions is therefore based on the increase in knowledge during the last seven years which, of course, must be recognized.

In changing codes we must keep in mind the large amount of labor involved, as it means that the Mortality Investigation Departments must work with two different codes, or re-code tens of thousands of cards, or in the aggregate for all companies, millions of mortality cards. The labor involved can be best exemplified by the change in the code for heart murmurs. For many years prior to 1925 heart murmurs were coded according to the diagnosis of the medical examiner or of the medical staff at the home office of the company. The code was changed in 1925 increasing the number of classifications from seven to eighteen so as to cover a statement of the condition found by the medical examiner. To obtain the material on a homogeneous basis for the recent investigation, all cases of heart murmur for the issues of 1909 to 1924 had to be re-coded at the Home Office. In spite of the amount of labor involved I think that the code for medical impairments should be thoroughly studied, making changes, however, wherever it is deemed necessary to do so and not following the fad of the hour in either medicine or surgery. There are many numbers which can still be used without disturbing the present arrangement.

There is undoubtedly a need for more clear definitions and more uniformity with regard to coding of certain impairments. I find, for example, in talking with medical directors that the definition of an inconstant murmur is not always the same. Does it depend upon the position? Is it inconstant if heard at one time during examination and not at another? Is it inconstant if heard yesterday on examination but not today? With regard to uniformity in coding, an example may be given in connection with splenectomy which seems to have been coded in three different places by various companies,—namely, (183) enlarged glands, (300) circulatory, and (883) major surgical operation.

Another suggestion may be made when the code is revised,—namely, that there should be an index giving cross references, for which there is great need.

It is a great pleasure to again speak to a group of men with such breadth of training and with such liberality of thought that they are willing to consider seriously any suggestion, however radical.

DR. ROWLEY—The experience that most of the companies have had in the last few years on large risks has awakened our interest in this topic as never before.

The situation confronting us fully merits the careful studies made, and calls for the consideration of plans for improving upon our methods of selecting risks in this class.

More searching medical examinations and more thorough lay inspections added to a closer inter-company co-operation should help us in this difficult and important field of underwriting.

No one is more qualified to speak on this topic than is the secretary of the special committee that has been devoting itself to this question for many months. His paper has been placed before you and we all will be glad to listen at this time to Mr. Samuel Milligan, Third Vice President of the Metropolitan Life Insurance Company. Mr. Milligan.

LARGE RISK UNDERWRITING

BY MR. SAMUEL MILLIGAN, THIRD VICE-PRESIDENT,
Metropolitan Life Insurance Company.

I assume the reason for being invited to present this paper to your Association is my membership on the Joint Committee of the Medical Directors Association and the Actuarial Society studying the underwriting of large policies. The data herein contained is therefore, in great part, the result of the work of that Committee.

Among Medical Directors and Actuaries it has long been an accepted fact that the experience under large policies is less favorable than under policies for small or average amounts. From time to time experiences have been published on the basis of actual to expected claims disclosing this condition; the repeated recurrence of this feature indicates that little has been accomplished in the way of improvement. Recently the underwriting of certain large policies that became early death claims has been criticized by Company Officials and this raised the question whether the underwriting of large cases was as exacting as good business practices require. It was to answer this question and to make whatever recommendations deemed necessary that the Committee was appointed.

The underwriting of jumbo risks is the most complex and difficult problem on selection that the companies have ever been called upon to solve. The amounts involved are so large that the incentive to outguess the insurance company is very great. Therefore, the question of selection against the company is, undoubtedly, the one most important factor in these cases. When one considers the prominence of the applicant, the reluctance of agents to make inquiries which may antagonize the prospect and the difficulty in securing authentic information regarding past health, habits and finances, it might seem an almost hopeless task to ever underwrite these cases successfully.

It is a comparatively simple matter for a company to compile an actual to expected mortality experience where the risks readily divide into homogeneous classes. Securing the joint experience of all companies for such investigations also offers no obstacle. It is a very difficult matter, however, to compile the experience on large risks. An experience based on policies of a certain size, \$50,000 or over, etc., issued on one application is not only of little help but is really misleading. In such a compilation the data is heterogeneous; it includes risks where the amount investigated is all or practically all of the insurance carried as well as risks where the amount is but a small percentage of the total coverage. These latter cases will be greatly in the minority and whatever tendency they have to produce a high mortality will be hidden in the final figures by the favorable mortality displayed by the other cases which predominate in the experience. To disclose the true facts an experience on large risks must be compiled according to the total amount of insurance on the risks in all companies. No such experience, however, was available to the Committee, nor was it in a position to secure such an experience.* It was, therefore, necessary to approach the problem from some other standpoint.

Before deciding upon a definite plan of investigation, it was necessary to analyze the problem and to get our attention focused on the underwriting points which seemed of greatest significance. Only persons with large incomes can purchase large policies and, as risks, these can loosely be subdivided into three groups—those of large inherited wealth, those of large wealth personally accumulated and those of medium wealth personally accumulated. Consideration of the underwriting factors involved in these several classes indicated the particular problems involved in each and dictated the form of the investigation.

*It is of interest that the Medico Actuarial Mortality Committee is at present compiling an experience along the lines indicated above and the results are awaited with a great deal of interest. Undoubtedly, it will show that the companies as a whole have had a favorable experience when the total amount of insurance on the life does not exceed say \$200,000 or \$300,000 but that above this amount the experience will be increasingly bad as the amount of insurance gets larger.

Applicants from the inherited wealthy class undoubtedly present the fewest problems and are possibly the most desirable of the jumbo cases. The applicant is accustomed to wealth as it is a family characteristic and generally the enjoyment of it is free from any exacting duties pertaining to its care. He is generally not subject to the tremendous strain suffered by men of large affairs in active business. His worth and income are easily obtainable and the purpose of the insurance generally well defined. Besides, persons so situated can afford to take out a large amount of insurance while comparatively young. The underwriting factors of importance in these cases pertain principally to the health of the applicant and to the manner in which he spends his leisure time. The social prominence of the applicant makes it comparatively easy to get authentic information on this latter point.

Applicants of large wealth personally accumulated are not very numerous; they are, however, more difficult to underwrite than the inherited wealthy. The fortune of the applicant is generally distributed so that while there is a chance that adverse conditions may diminish the fortune, there is little probability of it being wiped out entirely. The question of suicide, therefore, does not loom up very importantly in these cases. It is seldom difficult to get information pertaining to the wealth and income of the applicant. Generally for personal coverage the purpose of the insurance is well defined but in cases involving business insurance an insurable interest must be clearly established for an amount appropriate to the losses that would be suffered in the event of death. In most cases the applicant is of a fairly advanced age and is seeking insurance after having undergone, for many years, a tremendous business strain. Such strain is, as a matter of fact, almost always still present and it is of the utmost importance to not only investigate all previous ailments but to insist upon a most complete medical examination. Particular attention should be given to the habits of the applicant and the form of recreation he enjoys in leisure time.

The most numerous and the most difficult to underwrite of all the jumbo cases are those of applicants who have become millionaires recently and generally quickly. The worth of the applicant may be tied up in one or two business enterprises that have been unusually prosperous over a short period of years, or the applicant, out of the profits of a very successful business, may have made a fortune in some speculative enterprise. In such cases it is of the utmost importance to judge the stability of the fortune, as competition, depressions or adverse market conditions may seriously affect the financial standing.

Undoubtedly, this class of case, in the event of over-insurance, constitutes a grave suicide hazard. A hastily constructed financial structure may be unable to weather a financial storm, it may even be undermined at the date the insurance is applied for. An applicant fearful of a crash may load up with a large amount of cheap protection, thus providing a means of leaving his family well off financially.

From a medical standpoint these cases are most important. Success has been attained by the personal efforts of the applicant and in one man concerns it is probable that death will seriously depreciate the value of the business so that if the applicant has any knowledge of a hidden medical impairment there is a great temptation to secure a large amount of coverage. In addition, of course, these applicants are subject to the, as yet, unmeasured strain that modern business visits upon successful men.

It seemed probable that an actual case analysis, if procurable, would prove or disprove the importance of the points raised in our *à priori* reasoning and permit of the isolation and study of each important underwriting factor.

There was at the disposal of the Committee the records incident to a considerable volume of business, which disclosed the prevailing practices among companies, and it was decided to study the actual underwriting of every case where the claim payment was \$200,000 or more, death having occurred during the

years of 1924 to 1929, inclusive, and within five years of the date of issue of the last policy. There were 101 such cases involving the payment of approximately \$69,000,000 at death, so that the claims averaged close to \$700,000. In 69 cases death occurred from medical causes with an average amount per claim of \$661,000, and in the 32 cases of death by suicide or accident the average death claim payment was \$721,000.

Each case was studied individually and the file contained not only the records incident to the payment of the claim but also all papers incident to the issuance of at least part of the insurance on each life. The medical deaths were most carefully reviewed by Medical Directors in an effort to trace any relationship which might have existed between the cause of death and the previously known medical history. These cases were further studied and subdivided into those where more extensive laboratory tests would have been beneficial and those which did not indicate that more extensive laboratory tests would have yielded additional information of consequence. After the Medical Directors had conducted their investigation of those cases, they were then gone over from a lay underwriter's point of view, particular attention being paid to the relationship between income and insurance, the kind of policy and the amount of insurance issued in recent years.

Cases of suicide and accidental death were investigated mainly from a lay underwriter's standpoint as there were no cases in this classification that indicated any morbid condition on account of physical fitness. After study these cases were further subdivided into two groups; those that showed a large proportion of the income applied to insurance premiums and those that did not.

The following classifications show the cause of death and the attained age at the date of death of the 69 cases where death occurred as the result of medical causes.

LARGE DEATH CLAIMS
MEDICAL CAUSES

Cause	Number	Amount
Circulatory		
Coronary Sclerosis, Thrombosis or		
Angina-Pectoris	17	\$13,753,700
Myocarditis	3	2,295,000
Acute Dilatation of Heart	2	813,722
Heart Block	1	308,000
Cardiac Failure	1	240,000
Acute Toxemia	1	500,000
Total	25	\$17,910,422
Respiratory		
Pneumonia	11	\$ 5,309,000
Pulmonary Tuberculosis	2	615,000
Pulmonary Embolism	1	500,000
Pulmonary Oedema	1	380,000
Total	15	\$ 6,804,000
General		
Cancer	10	\$ 3,820,496
Carbuncle	1	1,095,000
Hodgskins Disease	1	339,986
Diphtheria (Laryngeal)	1	407,500
Total	13	\$ 5,662,982
Digestive		
Cholecystitis	3	\$ 850,000
Appendicitis and Peritonitis	3	1,913,000
Intestinal Obstruction	1	2,855,000
Adynamic Ileus	1	500,000
Rupture of Liver	1	213,000
Cirrhosis of Liver	1	240,000
Total	10	\$ 6,571,000
Brain and Nervous System		
Cerebral Hemorrhage	2	\$ 872,000
Tumor of Brain	1	900,000
Total	3	\$ 1,772,000
Kidney and Genito-Urinary		
Nephritis—Acute	1	\$ 670,000
Uraemia	1	6,000,000
Total	2	\$ 6,670,000
Miscellaneous		
Post-operation—Shock	1	\$ 230,000
Total	1	\$ 230,000
GRAND TOTAL	69	\$45,620,404

Age at Date of Death	Number	Age at Date of Death	Number
34	1	54	3
38	1	55	2
41	2	56	3
42	1	57	3
43	1	58	3
44	1	59	1
45	2	60	6
46	3	61	3
47	4	62	3
48	2	63	1
50	4	64	4
51	3	65	2
52	5	66	2
53	2	68	1
		Total	69

A study of the papers incident to these 69 cases convinced the medical members of your Association who conducted the investigation that in 28 of these cases (approximately 40%) involving \$19,200,000 of claim, more extensive medical tests than those used would likely have disclosed information of great value in passing on the applications. In the majority of the cases where heart lesions were the cause of death, it is probable that an electrocardiograph would have resulted in declination. In some of the other cases fluoroscopic or X-ray examinations would probably have resulted in rejection.

It was very significant that at the date of the last application 21 (out of 28) of these cases had a previous record either active or cancelled and that in 15 of them extensive correspondence was necessary to clear up the past records or conflicting medical testimony before the companies were willing to write the insurance. The ultimate acceptance of these risks did not prove very profitable as three of them died within six months, six within one year and 13, approximately 50% of the total, within two years. The average duration on the entire 28 cases was two years and five and one-half months.

It is apparent that deliberate imposition is practiced upon the companies by the withholding of significant information. In four of the cases the claim papers disclosed medical attention prior to the date of the last application, of which the companies had no

knowledge. In at least three cases credit reports disclosed record of previous illnesses unrecorded in the application. In one case it was the opinion of the doctor signing the death claim papers that the affliction causing death had been present for many years and, therefore, before the latest insurance was taken out. In several cases medical attention was sought for a serious medical impairment within such a short time after the date of issuance of the insurance as to make the cases look very questionable. In at least four cases there is serious doubt as to the good judgment exercised in accepting the risks; it does seem that there was sufficient information on hand to justify a rejection. It would appear in several cases that if the information on hand, casting doubt upon the insurability of the risk, had been more carefully and thoroughly investigated, significant facts would have been disclosed.

While it is true that the principal papers studied were those pertaining to the issuance of the most recent insurance, so that the above comments refer only to the latest policies issued and not to the total amount of insurance, it is significant that in the 28 cases approximately 62% of the total amount of insurance was taken out within five years of the date of death. In 18 of the cases over 20% of the income was applied to the payment of premiums and in approximately 8 cases the figure was over 30%.

Considering the large amount of money involved, the age of the applicants and the undoubted evidence of selection against the companies, there can be little question but that applicants for large amounts should be subject to the more advanced methods of medical examination and that more thorough investigation should be made of past medical histories and treatments. Over-insurance should be made impossible by the adoption of rules governing the total amount of insurance that may be obtained considering age and income, and these rules should differentiate between standard and sub-standard classes permitting a much smaller total maximum on cases sub-standard for medical reasons.

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The following classifications show the causes of death and the attained age at the date of death of the 32 cases where death occurred as the result of suicide or accident.

LARGE DEATH CLAIMS NON-MEDICAL CAUSES

Cause	Number	Amount
Suicide	11	\$10,617,900
Total	11	\$10,617,900
Suspected Suicide		
R. R. Crossing Accident	2	\$ 841,000
Fall Elevator Shaft	2	2,587,330
Drowned	2	700,000
Monoxide Gas	1	2,042,000
Train Accident	1	775,000
Total	8	\$ 6,945,330
Accident		
Explosion	2	\$ 820,000
Gunshot Wound	2	570,000
Auto Accident	2	672,500
Drowned	1	1,500,000
Thrown from Horse	1	225,000
Monoxide Poisoning	1	242,500
Fall in Elevator	1	253,000
Aeroplane Accident	1	200,000
Total	11	\$ 4,483,000
Miscellaneous		
Murdered	1	\$ 325,000
Fell or Jumped from Window	1	725,000
Total	2	\$ 1,050,000
GRAND TOTAL	32	\$23,096,230

Age at Date of Death	Number	Age at Date of Death	Number
28	1	47	1
30	1	48	2
34	1	49	1
36	1	51	3
38	1	52	1
39	3	53	3
41	1	55	2
44	1	56	1
45	2	57	2
46	2	62	1
		63	1
		Total 32	

In 11 of the 32 cases suicide was reported as the cause of death but in at least 8 other cases the supposition is very strong that the policy-holder committed suicide. Out of the entire 101 cases, therefore, we had approximately 19 suicides (constituting 19% of the total claims) and 12 accident claims, giving combined suicide and accident claims of 32 in number or 31% of the entire cases studied. This percentage is over twice the normal.

Of the 32 suicide and accident cases, 18 showed a high percentage of income being applied to insurance premiums. Of these 18 cases, 8 deaths were caused by suicide and the supposition of self-destruction is very strong in 7 other cases. The total amount of claim on these cases was \$18,337,000, an average of a little more than a Million Dollars apiece, as compared with an average death claim payment of \$370,000 on the other 14 accident cases. There is no doubt that there is a tremendous selection against the companies when policy-holders are permitted to apply a large proportion of the income to insurance premiums. Out of 18 cases, suicide was the cause of death in 15 or 83% of the total; not only that, but the average amount of death claim was almost three times as much as on the cases where accident was the cause of death. Proof of selection against the companies is further disclosed by the fact that of the total amount of insurance involved in these 18 cases, 58% was taken out within two years of the date of death, 64% within three years and 82% within five years.

The difficulty of determining definitely what percentage of the income was really applied to the payment of premiums, makes it impossible to gauge the extent of the over-insurance, but in none of these 18 cases could the percentage have been less than 25 if all the insurance had been on the Whole Life plan and in at least 10 of these cases the percentage would have been at least 50. The three largest cases, involving in no case less than Two Million Dollars, would have required over 100% of the income to pay premiums if the insurance had all been on the Whole Life plan. There is little doubt of our inability to control speculation if applicants are permitted to apply a large percentage

of their income to the payment of insurance premiums. Moreover, the tendency on the part of speculative risks to purchase Term policies and policies that have a low initial cost indicates the necessity for some rule governing income and insurance which will not permit of more insurance on the life just because the coverage is on a cheap plan.

In the over-insurance cases disclosed there was a marked tendency to understate in the application the total amount of insurance outstanding. In addition, complete information was not furnished to each company pertaining to the total amount of insurance concurrently applied for in other companies. This meant that each company was underwriting the risk without exact information as to the total amount of insurance contemplated. When one of our present policy-holders applies for additional insurance, we check the standing of the insurance already issued and it is much more imperative to have a similar check in these large cases involving many companies. Some means must be devised whereby a company receiving an application can secure an authentic record of the insurance now in force and the total amount concurrently applied for. This situation that needs correcting is bad now but will get worse as soon as a rule is adopted governing the percentage of income that can be applied to purchase insurance.

There are, of course, many reasons for speculation but by far the most important, as developed in these accident and suicide cases, is poor financial condition. An applicant with an ulterior motive tries to keep the company from learning the true state of affairs and our study disclosed that such persons will go to unbelievable lengths to conceal unfavorable facts. It is not sufficient to determine the present income of the applicant; one must also know the standing of the applicant's business as some of our outstanding claims have arisen because of the collapse of what appeared to be a legitimate and sound enterprise. Business proprietors for large amounts of insurance should be required to furnish a recent statement of the condition of their business. We are not justified in relying upon such assurance

as "This man is financially responsible and does not make it a practice of making public financial statements incident to his affairs".

The purpose for which the insurance is required must be well defined and the amount in keeping with the insurable interest of the beneficiary. Several cases have occurred where the reasons given for taking out the insurance were proper ones. The companies accepted these reasons as true only to find out after the claim arose that such reasons were untrue in that particular case.

When dealing with the direct business of their own agents companies insist on being furnished with a complete report of how the case came to be written, the names of all interested agents, total amount of insurance involved, etc., but many of these large cases arise through independent salesmen. They are submitted to the companies through their various General Agents and in consequence it is very difficult to get complete information. One company is played against another and the demand to out-do each other in the matter of speed is not conducive to the proper underwriting of the cases. A reasonable time must elapse if the case is investigated, studied and underwritten with judgment.

The one outstanding point developed in our investigation was that where selection against the companies was theoretically possible such selection has actually occurred and that the underwriting rules in operation at present are not sufficiently stringent to eliminate such selection. The underwriting of large cases requires the adoption of rules which will

- (a) Utilize more advanced methods of medical examination
- (b) Require a thorough investigation of all past illnesses and medical treatments
- (c) Develop the true financial condition of the applicant, his moral character and habits
- (d) Limit the total amount of personal insurance on a life to such amount as a reasonable percentage of the income would purchase at net cost on the Whole Life plan
- (e) Prohibit the issuance of excessive amounts of business insurance

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- (f) Not permit action to be taken on an application until the amount of insurance already on the life, the amount contemplated and the purpose of the insurance have been disclosed to the company.

Even if rules as outlined above are adopted and rigidly adhered to, it is questionable whether we shall ever produce as good a mortality as among risks of average size for, undoubtedly, men of large affairs are subject to a strain in business which may be sufficiently severe to preclude all hope of producing average mortality. This is a question requiring further study and medical research.

In the general run of our business where the risks are average and the amounts reasonable and within our own retention, one company is not very much concerned with the underwriting rules of other companies. On large risks, however, conditions are exactly opposite; many companies are involved and the action of one company may very well cause the business of a company already on the risk to change from the desirable to the speculative class. The solution of our problem, therefore, requires the active and earnest co-operation of all companies and the adoption by them of similar rules and practices. Without these essentials the experience on large cases will remain unfavorable.

DR. COOK—Mr. Milligan's paper has been to me one of the most interesting and instructive that has been presented before this Association in years. While it will give added emphasis to the prejudice which we have all felt against the jumbo risk, it will alter and clarify very definitely some of our conceptions as to the source of danger, especially as to the cause of death to be anticipated.

Mr. Milligan has so clearly stated the moral and speculative hazard in these cases, and the marked self-selection against the company, that while heartily endorsing all he says on that score, I shall confine my remarks to discussing the medical aspects, and especially in what way we should modify our examinations and our action so that we may have as adequate protec-

tion as possible. I agree with Mr. Milligan that with the marked incentive to self-selection, the agency and official pressure involved, and the knowledge now at the disposal of these men of means to pass our underwriting requirements, we can probably never obtain as favorable an experience as on the small risk. However, it is obvious from Mr. Milligan's presentation that up to the present time we have shown a most costly weakness in permitting these excessive losses on jumbo risks, both in not obtaining the necessary facts for wise selection, and even worse, in not acting with firmness on those that we do obtain. We all of us know of the large shopped brokerage cases with a long previous record of hypertension, or albumin, casts, or heart murmurs, etc., which are constantly being accepted for standard insurance, perhaps for limited amounts, on such flimsy reason that finally two physicians can be obtained by an energetic and unscrupulous broker who are willing to pronounce a persisting heart murmur in a man of 50 "functional", or to "shade" their blood pressure readings to 140, to overlook an intermittent pulse, or to authenticate a specimen "brought to the office" but not passed in their presence. I am afraid that we must admit among ourselves that American Life Insurance has been an easy mark for some of these enterprising brokers and their clients. Both the jumbo risk and the Income Disability claimant have during the past decade proven expensive luxuries for the life insurance industry.

From the viewpoint of causes of death in these large risks, Mr. Milligan's paper has considerably simplified the problem. Before reading this paper I had attempted to outline a fraud-proof medical examination and had detailed a long list of clinical and laboratory tests, including X-ray of the chest, gastro-intestinal, teeth, gall-bladder, kidneys, detailed blood analyses, kidney function, catheterization, metabolism, etc. etc., but the following figures from his listings of causes of death materially changed the problem:

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Suicide (including probable).....	25%
Cardiovascular disease	28%
	<hr/>
	53%
Pneumonia	11%
Cancer	10%
	<hr/>
Total of four causes	74%

Suicide I shall leave to Mr. Milligan's fine analysis of necessary precautions in selection, with the single comment from the medical point of view, that perhaps some day psychiatry may have developed diagnostic methods sufficiently discriminating to indicate weakness of character and mentality which can be used practically in selection against this contingency. I do not believe we have reached that point as yet, except for such rough standards of morality and behavior as we ordinarily adhere to.

In regard to cancer, 10% at those more advanced ages averaging fifty-two years is not as great as the general male population where it runs about 12%, and I doubt if we can recommend further diagnostic procedure beyond the usual careful insurance examination, plus a digital rectal examination, which is a simple and reasonable requirement in any examination that is modestly complete.

Pneumonia we cannot foresee, except for a history of recent or previous attacks, or when it is the terminal manifestation of some chronic disease, such as diabetes, and especially cardiovascular disease. Possibly five of the eleven cases had such a cardiovascular background, judging by the high incidence of 28% of cardiovascular deaths in the group and from clinical experience.

The problem from a medical point of view therefore resolves itself largely into the paramount necessity of discovering cardiovascular disease. We know this condition is usually very chronic, so that it must have been present at the time the risks were accepted in a large proportion of these deaths, as the maximum exposure was only five years. Furthermore, clinical opinion

seems definitely convinced that the modern wealthy business man is very subject to the development of hypertension and other cardiovascular disease, perhaps for several reasons:

a. The hypertensive diathesis may be an incentive and an aid to success under modern business conditions. The man born of energetic, high-pressure ancestry may be fore-ordained to a better chance of material success and to die younger of cardiovascular disease.

b. Prominence socially and financially carries nervous and physical strain and responsibilities which there is reason to believe may induce and aggravate hypertension and heart disease, so completing the vicious circle. The typical high pressure business executive frequently becomes a high blood pressure patient.

c. Wealth and the personally temperate life are sometimes apparently incompatible. These men often smoke too much, eat too much, drink too much coffee and alcohol, and react only to stimulating instead of restful recreation. Perhaps it is too much ever to expect this strenuous, hypertensive type to take their relaxation and diversion in art, music, nature, philosophy, or science.

I believe Mr. Milligan is right in believing that medicine can today in many cases detect cardiovascular disease, but it involves very different underwriting requirements from those now in use. I would suggest necessary additional procedure under eight headings.

1. The choice and use of better examiners, free from the influence of agency selection. As long as companies choose their examiners with as little discrimination as at present and subject their continuance to agency prejudice, impartial examinations in these large cases are beyond probability. The appointment of a number of men in the same city on an equal footing, the business to go on the agent's preference to the most com-
plaisant, merely puts a premium on dishonesty or incompetence. Many of our best physicians have been antagonized by the indifference of the Home Office in making them subject, as

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examiners, to the caprice and favoritism of agents. Their personal experience has led them to believe that the companies do not want the facts, for if they report impairments they antagonize certain agents and receive no more examinations. Thorough, competent work *can* be obtained from well-trained men by cultivating their interest and loyally sustaining their honestly expressed opinions. Brokers in large cities make it their business to know which examiners are most profitable to employ, and some companies even go outside their own approved list in these large cases, giving the brokers an overwhelming advantage. The multiple examination of an applicant by ten or twelve physicians simultaneously is an amusing farce, but costly to the companies. I cannot, I believe, overemphasize the paramount importance of the utmost care in selecting competent, careful, reliable examiners, and then proving to them that theirs is the type of service we really want by adhering to them loyally over all agency objection. We shall deceive ourselves if we proceed on the theory that additional mechanical or laboratory tests *can* correct this defect in organization. Perhaps the selection of diagnostic clinics or especially competent consultants for these large cases may assist us. A committee of the Medical Directors' Association should certainly select competent cardiologists and roentgenologists in the larger cities who would be available for all of us at a reasonable fee, so that we may have dependable and comparable data for underwriting action and statistical analysis. X-rays and electrocardiograms to be dependable must be taken and interpreted under carefully controlled conditions and by thoroughly trained and experienced men of sound judgment.

2. A better history, with more details of habits, medical history, and symptoms. Here questions should attempt to elicit shortness of breath on exertion, sternal pain or distress, "indigestion", dizziness, dieting, headaches, etc. A supplementary history should be required in all large cases.

3. A six foot plate of the heart, including the lung fields, and in some cases it might be advisable to get an esophagogram.

Cardiac hypertrophy or dilatation is of the most vital significance and cannot be developed accurately without the X-ray. Dilatation of the aorta is also most important to detect if present.

4. The electrocardiogram. As with all new tests, the significance of the electrocardiogram is by certain enthusiasts much overvalued. Mr. Milligan has, I think, over-emphasized its value when he says that in a majority of cases where heart lesions were the cause of death, it is probable that an electrocardiogram would have resulted in declination. I wish this were correct, as it would immensely simplify both insurance and clinical diagnoses, but I fear it is true in only a minority of cases. However, it is true often enough to fully justify the use of the electrocardiogram, but it would do us far more harm than good and give us a very false sense of security if we accepted negative electrocardiograms too conclusively. We can, however, pick up and exclude some serious irregularities in rhythm, and some cases of myocardial changes and coronary sclerosis, but again I would warn, not all by any means, nor even a majority.

5. More accurate and more severely selected blood pressure readings. We are not receiving accurate blood pressures in many of these large cases. Examiners are very prone to shade their reports and to give the minimum reading they find, sometimes the minimum even from several examinations. Minimum readings, taken after rest or treatment, are extremely misleading and dangerous. Examiners must be frequently instructed on this point. Blood pressures vary widely and an examiner comes in for a great deal of criticism from agent and applicant if he reads and reports 150 when another good man yesterday made it 138 or 140. But more important, we must rate our hypertensions more severely. We used to say 150 at age 50 and over was normal, but now we must question whether a constant systolic of 140 is normal at any age. Personally, I do not think so. An X-ray or an electrocardiogram in all systolic pressures over 135 would be most interesting, and I believe revealing. The group between 135 and 145 would show a relative preponderance of beginning and some advanced cardiovascular dis-

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ease. We must bear in mind the opinion of Alvarez and Stanley after a study of six thousand blood pressures from 15 to 84 years of age, that "a pressure of 115 mm. Hg. is just as normal, and a pressure of 140 mm. Hg. is just as abnormal in an old man as in a young one". Dr. Hunter ten years ago pointed out that "average" blood pressures at various ages do not represent "normal" blood pressures.

6. Less credulity on the part of the Home Office in believing that cases over 45 years of age showing a history of albumin, casts, sugar, heart murmurs, or hypertension can often be "cured"—either by diet, extraction of an abscessed tooth, tonsillectomy, epithelial pigmentation, a cholecystectomy, or other of our present popular medical curative procedures. To accept such cases, or "functional" heart murmurs on the opinion of eminent cardiologists, or "benign" and "nervous" hypertensions as standard risks, is to invite excessive losses.

7. Especially, more strict interpretation of previous and present signs and symptoms of heart disease, i. e., history of pulse irregularities, hypertension, or heart murmurs. We must keep in mind in these large risks that they are markedly predisposed to heart and arterial disease, that their life accentuates the tendency, and that they are in a position to buy the best medical advice, so that they have early suggestion for the need of insurance and expert coaching to pass the examination; also, that examiners find it more difficult to report an impairment in the case of a wealthy and influential applicant than in the case of the average risk. All of which makes it imperative that we act more strictly on the evidence we do obtain in the jumbo risk rather than more liberally. Undue confidence in negative evidence from mechanical tests, such as electrocardiogram or functional heart tests, may seriously mislead us in these cases. Dr. Paul White and other clinicians are probably right in the opinion that so-called functional heart tests are rather tests of general muscular fitness than of probable longevity.

It will certainly be objected by some that I have omitted other clinical and laboratory requirements which they consider

essential, but I have been so greatly impressed by the causes of death in Mr. Milligan's series that I have felt we would do well to concentrate our attention on what is apparently the vital factor, i.e. cardiovascular disease—rather than to over-elaborate on factors that appear to be relatively unimportant,—for example, a Wassermann, dental X-ray, gastro-intestinal X-ray, renal sufficiency, blood sugar, etc.

In the University of Minnesota Clinic less than 1% of the total patients show a positive Wassermann. In a group of wealthy men, who have competent medical advice, the percentage would undoubtedly be very much less. This and the other tests could be used where indicated by history or other signs; for example, gastro-intestinal X-ray with any history of indigestion, or blood sugar with history of glycosuria, but I question whether we would not be unwise to over-complicate the procedure unless the additional tests would give positive indication in a sufficient percentage of the applicants to make the expense and difficulties practical.

8. Last and perhaps more important than all, I want to emphasize the necessity for sufficient firmness and decision in the Home Office underwriting personnel, whoever they may be, to act as wisely on a \$100,000 case as on a \$1,000. I am afraid that our lay underwriter clerks would often promptly reject a small risk with the same impairments that we ultimately and collectively accept for \$1,000,000. However valuable Mr. Milligan's paper undoubtedly is, it is worthless to us unless we act on its suggestions. In this connection I will close with a story Mr. Murphy told at a recent meeting of the Home Office Underwriters Association. A farmer was approached by a farm journal subscription solicitor. After the salesman had explained how valuable all this information would be to him, the farmer drawled, "Shucks, I don't farm now, near as well as I know how to". As Mr. Murphy suggested, "Few of us are underwriting near as well as we know how to", and I would add, "especially in the case of the larger risk".

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DR. PATTON—I know of no one connected with life insurance who has shown a deeper interest in underwriting than Mr. Milligan, nor one who has approached the question with more understanding of the problems that must be met.

It has been my good fortune to be with him a number of times during the last two years where underwriting of large risks has been the topic for consideration. Much of the material upon which his paper was based came before these meetings. Many things that are not directly medical enter into the underwriting of life insurance, but one of the cornerstones of successful life insurance is shaped and laid by the medical branch of the business. We are all familiar, in a general way, with the experience obtained in the insurance of risks for large amounts. The hazards of this class of policies has greatly increased during the last five years and especially so within the last two years. We have been increasingly careful in our office in the approval of large cases the past few years and I learned recently that our 1931 experience has shown an improvement. Our large cases are considered by a committee. The issue and medical departments attend to the collection of all information from medical, inspection and agency sources. The assembled papers are then referred to a medical member of this committee to pass upon the physical features. If this opinion is favorable, that is so stated and initialed by him; but if the physical data indicates a rejection this is usually so stated and initialed by two medical members and the rest of the committee is relieved of any further consideration of the case. Should the medical approve the case physically, the top sheet so shows; but the medical man then registers his final vote on a separate slip after considering all the features of the risk, and this slip is detached from the other papers. A representative of the ordinary issue department then reviews the papers and records his vote in a similar manner. The papers are forwarded to a representative of the actuarial department who votes in a like way. The chairman of the committee then assembles the votes and if favorable, or if two of the votes are favorable, the policy is

usually issued; but if two are unfavorable the policy is usually declined. Doubtful cases may be referred back for more information or may be sent to one or two of the executive officers for their opinion, but the committee action is very rarely changed. We have found very rare occasions for a committee meeting though a case may be discussed by two members of this committee, especially during the preliminary or preparatory stages.

The opinion was recently expressed in one of the insurance journals that increased care or severity in examination and selection of large risks might discourage applicants and agents and thus decrease the volume of business written. Should this decrease affect the undesirable portions of this business we would welcome it and none of us need fear any such effect upon the desirable group of applicants or agents. The main idea is to improve the mortality with as little untoward effect as is possible upon the volume of desirable or profitable business of a company and its agency force. The results of the study upon the group of large cases that has been placed before the joint committee is awaited with keen interest.

The plans for additional or special examinations for large risks, especially in those with doubtful histories or findings, are being carefully considered. Some of these examinations will be, and some others may be, made obligatory, if the companies agree to participate in the underwriting in this manner. Other companies may continue to follow their individual methods so far as their own retention is concerned.

The new rich, or those whose financial worth has grown rapidly, will usually call for careful selection. Newer developed methods of laboratory character have come before us and we should plan for their more general employment. We have several papers for tomorrow's program that will elaborate along this line. We have all seen the opinion expressed in our claim papers that the insurance examination upon which the policy was issued was very incomplete as the physical condition that caused death should have been detected at the original examina-

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tion, if this had been a competent one. Many of these are so criticised because the critic does not know all the conditions that maintained during the examination and consideration of the risk for approval.

If we knew how to combat all of the forces that are assembled in doubtful risks to prevent complete honest histories and thorough examinations, we would be relieved of many of the difficulties in their underwriting. We must give especial consideration to those cases who apply for policies with our cheapest forms of premium coverage. We must all agree that the grade or dependability of the business will usually decrease in the same ratio as the interested agent's responsibility towards the company to which he presents the case. Your own appointed and well known agent is more dependable than one whose connection is only a casual one and many times only for the purpose of bringing a doubtful risk for your consideration.

We should give heed to the suggested rules in the last part of Mr. Milligan's paper.

CASES

None of us can deny the value that an electrocardiogram would have had in these cases that Mr. Milligan has furnished me from the group he has had reviewed:

1. Insured for 16 months—gave no history of illness or treatment but claim papers show he had been under treatment for coronary sclerosis for five years prior to his death.

2. Insured for three months—sudden death—no unfavorable history at examination—claim papers showed a heart attack 15½ months prior to death and a clinical record then of X-ray showing hypertrophy, etc.

3. Policy in force 19 months—no history but claim papers showed an attack of angina pectoris 32 days after insurance examination.

4. Policy in force four years—information of high blood pressure for seven years prior but this was apparently cleared by an ordinary examination—death certificate of angina pectoris

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under treatment for ten months. Knowing what we do now of the electrocardiogram in blood pressure histories, who can doubt the desirability of its use at the examination prior to the issue of the policy?

Recently we had two cases in our office which we declined because of unfavorable electrocardiograms.

A man aged 57 who holds about \$140,000 with us applied for \$110,000 additional. There was an old history of duodenal ulcer that apparently had been followed by a complete recovery. We were thoroughly satisfied as to the moral and financial hazards. An electrocardiogram was obtained, also results of retinal examination. The unfavorable feature was a prolongation of the P-R interval and we decided not to increase our amount at risk. Because our manager was a personal friend of the applicant, who was an old policy-holder, we gave them more information than we usually do and furnished them with the names of two cardiac consultants. The applicant called upon me after having consulted one of these physicians and when he left my office he stated that he still wanted the insurance but if he was in the business he would not consider himself a good insurance risk. Since that visit he has seen the other consultant. Both these clinical men have given him proper advice as though he were a patient, but each has also expressed the opinion that his heart action was not entirely normal and that he should decrease his business obligations and take things easier.

DR. WILSON—I feel very much honored and very embarrassed in being asked to take part in this discussion. I have never seen a “jumbo risk”, but after the discussion today, I feel like the story of the purple cow. I would rather see than be one. (Laughter.)

The points brought up, I think, are important, and I think one of the most important is the question of, you might say, the clinical study. I mentioned the question of psychology in connection with where a person is examined. I can't begin to emphasize what a difference you would get in the story told by

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the applicant in your own private office rather than in his own home or in his office or in an insurance office.

I think one of the biggest disadvantages in the big cases is the printed form. Every clinician has given up printed forms except perhaps, to note negative findings. Every examiner of any standing, especially chief examiners, knows the questions to ask, and while "diseases in the past" are important, not enough stress is made as to inquiring about symptoms in detail. In "jumbo risks" you are not dealing with applicants for insurance; you are dealing with individuals and the clinical side becomes of far more importance than in the average case. You have got to get the benefit of that clinical side and you are going to lose it as long as you follow the printed form, requiring "yes" or "no" answers.

In regard to the laboratory findings, I don't think there is any question that in these cases one thing certainly is called for with the cardiovascular cases, and that is the "six-foot film". You can depend upon the "six-foot film". You can have it sent to you and you can read it. You can get information from it that is invaluable. Personally, I have a good deal of doubt as to the positive and negative value of electrocardiograms made by anyone and interpreted by anyone. I think that a small percentage of them will be a help. It will be a saving, yes, but it won't begin to be the saving that the x-ray film is. The technique of the film today is far more accurate in the hands of the average Roentgenologist than is the electrocardiogram.

The question of the selection of the man who does the work, the place where he examines, and the giving of the data to him in a letter from the Home Office (not "Confidential Information" but that we "would appreciate careful inquiry" as to symptoms and diseases in the past of certain definite tracts of the body) is most important.

I can't emphasize too strongly what Dr. Cook said about multiple examinations. Eight or ten doctors in a room—none get anywhere. It is a farce. Two examinations—never together

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—separate, yes. As I said before, it is the man who does it and I think myself in these “jumbo cases” it is far better not to have a printed form, but to leave it to the expert examiner who is skilled in internal medicine and skilled in underwriting to ask the questions and develop the history as one does with a private patient.

DR. HUNTER—I am not prepared to discuss the mortality on jumbo risks, but should like to draw your attention to two other classes which show a high relative mortality in connection with reinsured business. One of these is the type of risk under which there have been records of various impairments within a few years. The other is the type where the Company did not wish to take its limit and accordingly divided the amount among several companies. The judgment of the company receiving the applicant which, for example, took \$10,000 of an amount of \$25,000 to \$50,000 and offered the balance to other companies *at their option* was evidently correct in considering the risk doubtful or border-line.

MR. MILLIGAN—All I have to say is “Thank you” for the interest you have taken in this paper. Those who discussed it added at least 100 per cent to its value. The general underwriting of the companies is so skillfully done that practically any company can produce the actual to expected mortality that it pleases, and I am sure that our unsatisfactory experience with these cases is due to the fact that we haven’t given them proper study. Now that the matter has been chased out into the open, I am sure the problem is solved and improvement will soon be in evidence.

FIRST YEAR DEATH CLAIMS

G. A. HARLOW, M. D.,

*Assistant Medical Director Northwestern Mutual Life
Insurance Company*

Table I gives the cause of death and the number of deaths in each year for the past six years. The first column is the year 1925 and records the % of each group to the total first year deaths. The same is true for the years 1926-1927-1928-1929 and 1930. In the last column the above 5 years are compared to the year 1925, which showed a very satisfactory first year death rate of 25% Am. Exp. Table.

Table II shows the percentage of deaths from Cancer, Apoplexy, Angina Pectoris, Appendicitis, Gastric and Duodenal Ulcer and Auto Accidents to total deaths of those insured less than one year, 1925 to 1930 inclusive.

Table III shows the percentage of deaths from auto accidents to total casualties during the following years: 1912-1921-1922-1926-1927-1930.

As long as life insurance companies exist it is axiomatic that first year death claims must occur; accidents and acute fatal infections such as pneumonia, typhoid fever, erysipelas, scarlet fever, cannot be fully anticipated. Even the 1-year clause will not prevent a certain small per cent. of members from taking their own lives.

A total of 17 first year deaths from apoplexy during the past six years may not seem large but it goes to confirm Janeway's statement in his book on the Clinical Study of Blood Pressure, published in the very early days of blood pressure study, "The Sphygmomanometer gives no positive evidence of the existence of changes in the brain vessels". (1) So we must confess our inabil-

(1) "The Clinical Study of Blood Pressure," Janeway; page 248. 2—Diseases of the Brain. A. Vascular Disease.

ity to protect our Company from all deaths from apoplexy during the first year.

Forty-four deaths from Angina Pectoris during the 6-year period makes us wonder if we had an honest symptomatic history given by the Insured and the question further arises—could we have kept these risks off our books if we had had an electrocardiogram taken when the risk was being considered.

M. H. Kahn analyzes a series of 330 cases of typical Angina Pectoris; 23 or 7% died during an attack; of all the patients 137 or 41% showed negative electrocardiograms during the entire period of observation. In the fatal cases, 30% of the patients had negative or insignificant electrocardiograms during the entire period of observation. Here again our so-called instrument of precision has failed us and we must confess that as yet we are unable to protect our Company from all first year deaths due to Angina Pectoris. (2)

A total of 37 first year cancer deaths; 58 deaths from appendicitis and 14 deaths from gastric and duodenal ulcer during the 6-year period all make us wonder if our history taking is defective and whether our examiners are using their five senses as they should. Whether or not we agree with Thayer of Johns Hopkins (3) that, "The initial talk between physician and patient is often the most important element in diagnosis; that one of the first bits of information we must acquire is some sort of conception of the manner of life of our patient; that is, his daily cycle. If we begin by asking him how many hours of sleep he has; when he arises in the morning; how long it takes him to dress; what exactly are his relations to the daily evacuation of his primæ viæ; how long he takes for his luncheon and dinner; when and how he smokes and drinks; if we begin by discussing these questions with the patient, we very often acquire the key of his symptoms!"—at least the insurance companies might not be amiss in revising their blanks so that the above information became a part of each record. May it

(2) *Annals of Internal Medicine*; Ann Arbor, Michigan; June, 1931. The Electrocardiogram in Angina Pectoris. Doctor M. H. Kahn.

(3) *Military Surgeon* October, 1929; *Diagnostic Information of Physical Examination*. Brigadier General William S. Thayer, M. D.

not be true that more indirect questioning of the applicant would lead to the uncovering of physical defects which we fail, time and again, to uncover through our yes and no questions?

There were 75 first year deaths from auto accidents for the 6-year period, the largest number of deaths of any group. We take a little comfort from the fact that deaths from casualties from the beginning of the Northwestern Mutual Life Insurance Company have remained consistently at about 7.0% of all deaths, but we find no comfort when we study the percentage of deaths from auto accidents to total casualties during the following periods:

- 1912-1921: Auto Casualties 522; Total Casualties 2,212; percentage 23.60%.
- 1922-1926: Auto Casualties 592; Total Casualties 1,559; 37.97%.
- 1927-1930: 747 Auto Deaths to Total Casualties 1,717; 43.51%.

Are we ready to stop, look and listen and, as a united body, do something constructive to decrease this appalling tragedy? I believe that an anti-accident propaganda, vouched for by all the companies represented in this Association, would get results in markedly decreasing this tragic mortality burden from auto deaths. At the 20th Annual Meeting of the National Safety Councils in Chicago on October 12, a letter from President Hoover was read in which, among other things, he said, "The fact that there are 33,000 motor vehicle deaths annually in the United States is a challenge to the efforts of the safety organizations and the co-operation of every motor vehicle operator". Are we, gentlemen, to sit idly by and refuse to accept the challenge?

Time will not permit me to analyze each separate group, but I cannot believe that the experience of the Northwestern Mutual Life Insurance Company has been unique when compared to the experience of other companies in first year claims. If my surmise is correct, then we must acknowledge that improved training in obtaining symptoms, history and in the use of the five senses in examinations for life insurance is urgently needed.

TABLE ONE
NORTHWESTERN MUTUAL LIFE INSURANCE COMPANY DEATH CLAIMS RECEIVED ON
MEMBERS INSURED LESS THAN ONE YEAR (1925-1930 INCL.)

Cause of Death	No.	1925		1926		1927		1928		1929		1930		Total Five Years No.	Total Five Years %
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Typhoid Fever	7	5.3		0		1		3		0		1		5	.8
Malaria	1	.8		0		0		0		0		2		4	.6
Influenza	5	3.8		1		5		6		2		0		14	2.2
Encephalitis an Meningitis	2	1.5		1		2		5		2		6		16	2.5
Other Epidemic Diseases	4	3.1		5		1		2		0		1		9	1.4
Tuberculosis	2	1.5		3		6		1		1		0		11	1.7
Septicaemia	2	1.5		1		1		1		1		1		9	1.4
Other Infectious Diseases	1	.8		2		1		0		1		5		9	.8
Cancer	6	4.6		4		6		5		6		10		31	4.9
Other General Diseases	7	5.3		4		1		4		1		4		14	2.2
Brain Tumor	2	1.5		2		0		2		0		1		5	.8
Apoplexy	1	.8		3		2		3		3		5		16	2.5
Other Nervous Diseases	0	0		2		1		0		0		0		3	.5
Endo and Myocarditis	3	2.3		5		6		2		5		5		23	3.7
Angina Pectoris	10	7.6		9		6		6		6		7		34	5.4
Other Diseases of Circulatory System	0	0		0		0		0		1		6		7	1.1
Pneumonia	19	14.5		24		12		16		9		14		75	11.9
Other Respiratory Diseases	1	.8		1		3		0		5		2		11	1.7
Gastric and Duodenal Ulcer	3	2.3		1		5		1		0		4		11	1.7
Appendicitis	13	9.9		11		12		9		6		7		45	7.1
Intestinal Diseases	3	2.3		2		3		2		2		5		13	2.1
Liver Disease	4	3.1		4		4		2		2		3		15	2.4
Other Digestive Diseases	3	2.3		5		0		6		2		0		13	2.1
Acute Nephritis	0	0		2		0		1		1		1		5	.8
Suicide	5	3.8		5		6		1		12		10		39	6.2

First Year Death Claims

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TABLE ONE (Continued)
NORTHWESTERN MUTUAL FIRE INSURANCE COMPANY DEATH CLAIMS RECEIVED ON
MEMBERS INSURED LESS THAN ONE YEAR (1925-1930 INCL.)

Cause of Death	1925		1926		1927		1928		1929		1930		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Accidental Asphyxiation	2	1.5	1	0.7	1	0.7	1	0.7	0	0	0	0	3	0.5
Carbon Monoxide Poisoning	2	1.5	3	2.3	2	1.5	0	0	3	2.3	0	0	8	1.3
Drowning	5	3.8	1	0.7	5	3.8	9	6.5	5	3.8	11	8.1	31	4.9
Fall	0	0	4	3.1	2	1.5	1	0.7	0	0	3	2.3	10	1.6
Death by Firearms	0	0	0	0	1	0.7	0	0	0	0	4	3.1	5	0.8
" " from Fracture	1	.8	0	0	2	1.5	4	3.1	0	0	2	1.5	8	1.3
" " by Machinery	0	0	0	0	0	0	0	0	4	3.1	0	0	4	0.6
" " " Airplane	0	0	0	0	0	0	2	1.5	1	0.7	1	0.7	4	0.6
" " " Automobile	10	7.6	14	10.4	13	9.7	11	8.1	15	11.2	12	9.1	65	10.3
" " " Tractor	0	0	0	0	1	0.7	0	0	1	0.7	0	0	2	0.3
" " " Railroad	0	0	0	0	5	3.8	1	0.7	0	0	0	0	8	1.3
" " " Other Causes	2	1.5	2	1.5	2	1.5	4	3.1	5	3.8	4	3.1	15	2.4
Homicides	4	3.1	1	0.7	1	0.7	0	0	3	2.3	2	1.5	7	1.1
Sudden Death	1	.8	0	0	0	0	0	0	5	3.8	3	2.3	8	1.3
Miscellaneous	0	0	5	3.8	5	3.8	3	2.3	4	3.1	3	2.3	20	3.2
Total	131	100	133	100	120	91.6	120	91.6	113	86.3	145	111.5	631	100

The Mortality Experience was very satisfactory for the year 1925 (25% Am. Exp. Table).
Deaths from Automobile and Carbon Monoxide to total casualties on members insured less than one year
(1925-1930) was 45.9%.

TABLE TWO
PERCENTAGE OF DEATHS FROM THE FOLLOWING
CAUSES TO TOTAL DEATH CLAIMS RECEIVED,
MEMBERS INSURED LESS THAN ONE
YEAR (1925-1930 INCL.)

Cause of Death	No.	Amount	1925 %	1926 %	1927 %	1928 %	1929 %	1930 %
Cancer	37	\$264,000	4.6	3.0	5.0	4.2	5.3	6.9
Apoplexy	17	194,000	.8	2.3	1.7	2.5	2.7	3.4
Angina Pectoris	44	521,000	7.6	6.8	5.0	5.0	5.3	4.8
Appendicitis	58	358,000	9.9	8.3	10.0	7.5	5.3	4.8
Gastric and Duodenal								
Ulcer	14	97,000	2.3	.8	4.2	.8	0	2.7
Auto Accidents	75	512,000	7.6	10.5	10.8	9.1	13.3	8.4

TABLE THREE
PERCENTAGE OF DEATHS FROM AUTO ACCIDENTS
TO TOTAL CASUALTIES DURING THE
FOLLOWING YEAR PERIODS

Year	Auto Casualties	Total Casualties	Percentage
1912-1921	522	2,212	23.60
1922-1926	592	1,559	37.97
1927-1930	747	1,717	43.51

Deaths from casualties to total deaths from all causes from organization of Company have remained consistently at about 7.0%.

Note—Approved for publication in the transactions of Association of Life Insurance Medical Directors.

DR. ROWLEY—"Life Insurance Without Medical Examination" is a topic that is relatively new in life insurance, but it deals with a practice that we have been engaged in for a short period of years but a long enough period for us to have accumulated some experience and some ideas as to what it all means. This topic has been splendidly handled by Dr. Bartlett and his paper, I presume, you have all read. I am going to ask Dr. Bartlett to present for us a resume of his paper before we open it for discussion. Dr. William B. Bartlett of the John Hancock of Boston. (Applause.)

LIFE INSURANCE WITHOUT MEDICAL
EXAMINATION

BY WILLIAM B. BARTLETT, MEDICAL DIRECTOR

John Hancock Mutual Life Insurance Company

The most revolutionary change that has occurred in our generation in the method of obtaining new insurance is the adoption of the non-medical plan whereby an individual may obtain a policy of life insurance without undergoing a medical examination.

Adopted first on this Continent in Canada in 1921 because of the difficulty then experienced in obtaining examiners in rural districts the method spread to the United States in 1924 and is now quite general.

In this paper I am concerned only with the writing of Ordinary policies on single lives without reference to a previous medical examination; the class of business commonly referred to as straight non-medical. I am not concerned with group insurance, wholesale, salary deduction or any similar method of writing insurance on groups of individuals, nor with the method of writing additional insurance without further examination on applicants previously examined.

I.

In spite of the very general adoption of this method and the importance of the subject very little has been written on Life Insurance Without Medical Examination. The Actuarial Society of America discussed the subject in 1921. In this symposium Mr. Kilgour outlined the history of non-medical insurance in England and attempted to estimate the value of the medical examination. He pointed out the advantages and disadvantages of the system. Some of the points brought out in the general discussion of the subject show very clearly how opinions may change in a decade. Two speakers believed the move to abolish the medical examination was against public policy and contrary to the growing custom

of periodic examination. The effect on the agency force was seriously debated and it was feared that the average sized policy would be reduced. Another speaker suggested a special dividend class for non-medical business. I will quote two statements by different speakers who surely had the gift of prophesy. "I believe that the future will prove the experiment to be sound and as profitable as the business medically examined, and that in a few years applications for at least \$2,500 and perhaps \$5,000 will be as readily accepted without medical examination as \$1,000 is today"—(V. R. Smith). "My viewpoint of insurance without medical examination is that the grip the Company holds upon its agents is one of the most important elements. If the agents are well trained, have been long in the service and are careful, honorable men, the danger incurred by the Company is comparatively small but business from temporary agents or brokers must certainly be cut out"—(Henry Moir).

Two papers have been presented to our Association on this subject, both by Dr. Scadding. At the thirty-sixth Annual Meeting in October, 1925, Dr. Scadding reviewed the non-medical situation in Canada. He told us why the method had been adopted and described how the business was carried on and how safeguarded. His report on the mortality experience gave the first definite assurance that the business could be safe and profitable. In concluding the discussion on his paper Dr. Scadding said the safety of the system rested on five considerations:

1. The common honesty of the community
2. Thrift underlying the contract
3. Dependability of the agent
4. Thorough inspection
5. Limitation of applications to small amounts

In 1928 he reported the combined mortality experience of four Canadian Companies. In the discussion following this paper we find it first suggested that the mortality might not be quite as favorable in the United States as in Canada.

Dr. Streight read a paper before the American Life Convention in June, 1930, entitled "Life Insurance Without Medical Exami-

nation". He enumerated the factors that excite a definite influence on mortality and showed how reliable information can be developed in most instances without examination. The physical condition however can only be determined by examination and the personal history is usually more complete when obtained by the examiner "for the layman often credits the physician with a prescience out of all proportion to that commonly possessed". Dr. Streight finds no adverse selection of disability risks on the non-medical business. He cites the mortality experience of four of the largest Canadian Companies and finds it much higher for ages over thirty-five than for the younger ages. He concludes that business may be profitably written without a medical examination as long as we maintain a careful scrutiny of our agents and of the applications as they come in. "Experience should impress upon us the necessity of continuing a very guarded selection if the present mortality is to be maintained."

In the discussion of this paper, Dr. Patton called attention to three facts established by his Company's experience.

1. Mortality of non-medical much heavier after age forty.
2. First year mortality on ordinary life plan has been more than double that of medically selected business.
3. Second year mortality fully one and a half times that of medical business.

Last fall Mr. F. D. MacCharles reported the experience of his Company—The Great West Life Assurance Company—to the Actuarial Society of America. His report is in detail and is worthy of careful study. He presents the first definite comparison between medical and non-medical groups. Let me quote his conclusions—"The experience of this Company would seem to indicate that the mortality under policies issued without medical examination is higher than that under policies issued with medical examination notwithstanding the fact that non-medical business consists of policies for relatively small amounts which might be expected to show a favorable mortality rate."

Mr. Franklin B. Mead discussed this subject at the American Life Convention Meeting in 1929. The experience of his Company

has been favorable which he attributes to careful selection and careful supervision of agents. He calls attention to the danger of writing this class of business on applicants beyond forty-five and to the difficulties that have been encountered in large cities.

II.

In order to determine the attitude of the member Companies of this Association toward non-medical insurance a questionnaire was sent to the Medical Director of each Company in May. I wish here to thank the Medical Directors and Actuaries of the various Companies for their interest and willingness to co-operate with me in this investigation.

Of the ninety-five companies addressed I found one had been merged with another member company; and one company failed to reply. Of the remainder, sixteen companies do not write insurance without medical examination; six write it only under special conditions; and seventy-one do a straight non-medical business.

If the Life Insurance Companies of America are ranked according to assets we find that fifteen companies make up 75% of the total. It is interesting to note that eight of these do not write non-medical insurance.

The sixteen companies that do not write any form of non-medical insurance will not be further considered in this paper but it seems advisable to glance briefly at the six companies that write this form of business occasionally or under special conditions. All of them offer it only to policy-holders who have had a previous complete examination within two or three years, the amount of such additional varying from \$2,500 to \$10,000. This is of course in no sense true non-medical insurance. None of the companies reported any mortality experience on this class of business.

Coming now to a consideration of the companies that do a straight non-medical business I believe it will be advisable to take up each portion of the questionnaire in order.

A—WHAT AMOUNT DO YOU ACCEPT WITHOUT EXAMINATION?

Maximum amount acceptable on male lives
without examination was reported as follows:

\$ 1,000 -	1 Company
2,000 -	8 Companies
2,500 -	18 Companies
3,000 -	20 Companies
3,500 -	1 Company
5,000 -	19 Companies
10,000 -	4 Companies

Two companies with a maximum limit \$10,000 will not accept more than \$5,000 in any one year. One company with a limit of \$5,000 will accept only \$3,000 in any one year. One company has a minimum limit of \$5,000.

The amount acceptable on female lives is usually less and most companies make a distinction between married women and single wage earners. Some will not accept the former for any amount while others limit them to one or two thousand. One company accepts single women, widows or divorcees who are remuneratively employed for a limit of ten thousand.

B—WHAT ARE YOUR LIMITATIONS AS TO PLAN OF INSURANCE,
IF ANY?

Eleven companies make no restrictions as to plan. One company will not consider for term unless the amount is \$2,500. The remaining companies restrict non-medical insurance to permanent plans excluding Term Insurance, Modified Life, Family Income Policies and other special forms.

No question was asked as to age limitations but the information was furnished by 18 companies. The upper limit was given as 45 by all but one which has a limit of age 40 in the United States and 50 in Canada. The lower limit varies from ten to eighteen.

C—IS AN EXAMINATION REQUIRED IF DISABILITY IS DESIRED?

Fifty-two companies grant income disability without examination but two of these require examination if applicant is a woman;

seven companies grant a limited amount of disability without examination; six others grant waiver of premium only and five require examination for any form of disability coverage; one company did not answer this question.

D—HOW DOES THE MORTALITY OF NON-MEDICAL BUSINESS COMPARE WITH THAT OF MEDICALLY EXAMINED BUSINESS FOR SIMILAR AMOUNTS AND AGES? WILL BE GLAD TO HAVE FIGURES, IF AVAILABLE.

None of the reporting companies had mortality figures prepared on this basis. The reports received, however, were most interesting and worthy of our careful attention.

No information—21 companies—Seventeen of these reported they had no figures available and four reported that their experience was too limited to be of value.

Favorable. No figures available—18 companies—Five said their experience was satisfactory but no figures were available; thirteen reported favorable experience but no figures.

Favorable. Partial investigation—6 companies.

Less favorable. No definite figures—6 companies—One Medical Director says, "Mortality is higher in the non-medical than in the examined business particularly during the select period. As the business becomes older there appears to be less difference between the two classes of business".

About the same. No definite figures—1 company.

Better than medical. No definite figures—4 companies—One company qualified this statement with the observation that the non-medical business is still young.

Replies with definite figures—14 companies—Three companies report their experience with non-medical as *more favorable*.

1. Estimated mortality about 30% American Experience Table as compared with an average mortality of 50% on examined applicants.

2. Non-medical 32% American Table.
Medical 35% American Table.
This on a volume of 150 million written over a period of 6 yrs.

3. POLICY YEAR	ALL BUSINESS	NON-MEDICAL
1	44%	64%
2	75%	51%
3	83%	54%

(By amounts - American Men Select Table)

Experience on non-medical *less favorable* than medical—11 companies

1. The mortality is about 20% higher than in the medically examined business.
2. Mortality of medically examined business average 45% of the expected. Ratio for non-medical business is from 60% to 65% of the expected.
3. The mortality loss is somewhat higher in non-medical business and markedly so over entry age 35. The mortality increased for each decade above age 30.
4. Average Company mortality last year was 74.6% by number. Non-Medical mortality was 83%. American Men Select Table.
5. Our experience with non-medical from 1925 to Dec., 1930, as compared with medically examined business was favorable. Under age 45 the mortality of non-medical by American Men Select Table was 59% by number and 56% by amount. Medically examined business under age 45 showed a mortality of 57% by number and 60% by amount.
6. No study has been made comparing non-medical business with medically accepted business for similar amounts, but a study has been made comparing the medically accepted business for the same ranges of ages as the non-medical, with the result that the non-medical mortality is 108% of the medical.

7. An analysis of our experience has been made for years of issue 1921 to 1930 exposed over the three year period 1928 to 1930, inclusive. The mortality experience for men on non-medical business over the period covered is 60.6% of the expected on American Men Select Table and for medically examined lives 53.7%. In the case of women there is a more marked difference between the two classes. The difference in mortality is comparatively small in the age group 15 to 30, whereas for ages 31 to 45 the difference is such as to indicate selection against the Company.
8. This Company furnished a table previously published in the Transactions of the Actuarial Society of America showing an increased mortality for non-medical business for all age groups except age at entry 15 to 19.
9. This Company reports they have not yet made a full investigation. Their figures indicate that their experience is quite similar in total ratios to that referred to in the previous paragraph.
10. Report from a Western Company received August 20. We have just completed our Non-medical Experience. It covers business issued for the years 1925-1928, inclusive, with exposures carried to anniversaries in 1929. It was in 1925 that we first wrote this class of business. Non-medical business has been written with limits of \$1,000 on women risks and \$2,000 on male risks between the ages of 18 and 50, inclusive. American Men Select Table used.

	Expected Mortality	Actual Mortality	Gain Loss	% Actual to Expected
Through age 45	234,677	188,000	46,677	80.1
Age 46 and over	31,164	43,000	11,836	138.0
	<hr/> 265,841	<hr/> 231,000	<hr/> 34,841	<hr/> 86.9

The most significant feature of this experience is the increased rate of mortality on business sold over age 45. The experience on the entire business of the Company

(including that of the non-medical) during the corresponding period, for business issued between the ages of 18 and 50 and measured according to the same standard was 60.3% actual to expected. The mortality under non-medical business is 44% higher than that of the entire business.

11. A large Canadian Company reports as follows: In Canada the experience under the non-medical policy has been very satisfactory, in fact the mortality experience to the end of 1930 has been about 85% of that experienced by amounts during the same time on our medically examined business and about 98% by policies. It should be remembered, however, that medically examined business contains policies of large amounts and a fair comparison of the mortality experience cannot be made.

In the United States the non-medical experience has been quite satisfactory at the younger ages. Above age 40 there is a notable increase in the rate of mortality and especially so in the foreign born central and southern European races. Because of this unfavorable experience the non-medical age limit in the United States has been changed to 17 to 40, inclusive. The selection of female lives must be more strict on the non-medical plan than on the medical and even with these restrictions the mortality is slightly heavier than that of the male lives and also heavier than medically examined female lives.

A study of this data has convinced me that with a few exceptions, the more thoroughly the mortality experience is studied the greater the tendency to report it as unfavorable. I cannot escape the conclusion that many of the favorable reports are based on impressions which will not be borne out by the facts when complete figures are obtained. I do not believe I am betraying any confidences when I state that six of the companies in the last group are Canadian companies which have had a long experience to draw

from and that two are American companies that were among the first to adopt the non-medical method. I shall report the experience of my own Company later in this paper.

E—DO YOU CONTEMPLATE INCREASING THE LIMITS ACCEPTABLE UNDER THE NON-MEDICAL PLAN OR MAKING ANY OTHER CHANGES IN YOUR PRESENT RULES?

Sixty companies answered this question in the negative; three are considering an increase from three to five thousand; two stated they were considering increasing the limits but made no statement as to the amount of increase; two are considering cutting down on the disability benefit; one company reports that they may cease writing non-medical in some states; one company did not answer.

Apparently there is very little tendency to make a change in the present rules or limits.

F—HAVE YOU FOUND THE NON-MEDICAL PLAN ENTIRELY SATISFACTORY? IF NOT, PLEASE EXPLAIN.

My choice of the term entirely satisfactory was unfortunate. Several medical directors picked me up on it. One said cynically that hardly anything in this world is entirely satisfactory; another said, to be entirely satisfactory the plan must be perfect!

On the whole the replies indicated satisfaction if not perfection. Sixty-four companies answered in the affirmative; forty-three of these without qualification or elaboration. The most enthusiastic answer was as follows—"Excellent for agents, policyholders and Company. It constitutes 55% of our new business." Several companies called attention to the necessity for careful supervision of the agents and to the desirability of a thorough inspection. One reply called attention to the difficulty in getting the agent to actually propound all the questions to the applicant; another to the tendency of agent and applicant to understate the weight. One company finds the method particularly valuable in country districts.

Six replies were unfavorable—one answered "No" without qualification. Three companies reported an unfavorable exper-

ience in large cities. One of these referred specifically to New York and Chicago and stated that they had discontinued non-medical in these two centers. Another Company has had several bad claims in Ohio, Michigan and Kentucky and has discontinued the non-medical plan in those states. I will quote two replies. 1. "A study of our experience has resulted in a lowering of the age limits to which the Non-Medical Plan is applicable. As to whether or not the increased mortality cost, over and above the freedom from medical cost, is offset by agency advantage is a question still undetermined." 2. "No. Moral hazard too great. Agent's don't seem to get the idea." I believe this last reply sums up the situation very neatly. The success of the non-medical plan is largely dependent on the interest, integrity and co-operation of the agency force.

III.

The Company with which I am associated began writing Ordinary insurance without medical examination in April, 1926. Men and self-supporting women between the age of 10 and 45 are accepted for a limit of three thousand dollars. Married and dependent women are usually limited to two thousand. All plans are acceptable except Term. Modified Life and Preferred Risk Life are not eligible as these forms are only written for five thousand or over. Disability and double indemnity are granted. All agents over six months in service have the privilege of writing non-medical insurance. An inspection report from an outside reporting company is required unless the application is personally inspected by a Manager or his Assistant; the report is waived if the applicant has recently received insurance in this Company on the medical basis.

We now have written over four hundred thousand policies on the non-medical basis. The comparative volume by number of policies and amount is shown by the following figures:

ORDINARY INSURANCE WRITTEN 1930

	No. of Policies	%	Amount	%
Non-medical	94,079	60	117,387,000	34
Medical	63,903	40	223,738,000	66

Since the adoption of the non-medical plan the size of the average policy has increased.

When non-medical insurance was first under consideration it was thought by some that the information given by the applicant to the agent on the non-medical questionnaire would be more complete than that obtained by the examiner. This belief, I fear, was too optimistic. We must not forget that agent and applicant are both interested parties to the transaction and it is hardly reasonable to believe that their report will be entirely free from prejudice. The following studies will show some of the dangers of omitting the medical examination.

An analysis was recently made of the applications received during a short period to determine what proportion of medical and non-medical applications gave an absolutely clean report. The results are quite surprising.

	CLEAN		WITH MEDICAL HISTORY	
	No.	%	No.	%
Non-medical applications.....	1,344	90	156	10
Medical applications	234	59	163	41

Granted that the medical history obtained may in many instances be trivial and inconsequential it is nevertheless apparent that the agent frequently does not obtain a complete history and it is reasonable to suppose that important information is often not disclosed.

To investigate this matter from another angle I studied eight hundred rejections occurring during the first few months of 1931 to determine in each case the source from which the information was derived that led up to the final rejection. Again the results are surprising.

Source from which information was derived that led up to final rejection	MEDICAL		NON-MEDICAL	
	No.	%	No.	%
Examiner	265	66	—	—
Applicant or Agent	27	7	56	14
Inspection report	46	11	192	48
Previous records	31	8	112	28
Inspection report & previous records.....	12	3	19	5
Miscellaneous*	19	5	21	5
Total	400	100%	400	100%

*Miscellaneous rejections were because of previous rejection in the Company or because we believed applicant already had sufficient insurance.

Combining the figures we find that whereas 73% of medical rejections are due to information derived from applicant or examiner only 14% of non-medical rejections are based on information furnished by applicant or agent. It is apparent how much we depend upon our investigation service and the previous records for unfavorable information in non-medical cases. We must not forget that as more and more cases are written without medical examination the protection afforded by previous records will gradually diminish.

The Company's rejection rate on medical business in 1930 was nearly five times that on non-medical business.

	Applications Received in 1930 (Excluding Postponements)	Rejections	%
Medical	69,813	5,910	8.5
Non-Medical	95,848	1,769	1.8

An analysis of these rejections by causes follows:

	MEDICAL		NON-MEDICAL	
	No.	%	No.	%
General	153	2.6	30	1.7
Brain and nervous	200	3.3	49	2.8
Circulatory	2,451	41.5	213	12.0
Respiratory	259	4.4	49	2.8
Digestive	228	3.9	33	1.9
Kidney and Genito-urinary	673	11.4	129	7.3
Family history	30	.5	13	.7
Miscellaneous medical	194	3.3	31	1.8
Weight	255	4.3	39	2.2
Other 800—habits, finances, reputation, etc.	1,467	24.8	1,183	66.8
	5,910	100%	1,769	100%

Note that two thirds of non-medical rejections are from causes other than medical.

Although it is probably not necessary to emphasize this further I cannot refrain from citing a single case that came to my attention a few weeks ago. Mrs. E applied for \$1,000 End. at 85. The non-medical report was entirely negative. On account of information received through previous records we asked for an examination and obtained the following history—Cæsarean sections 1920, 1923 and 1925; miscarriage and curettage 1927 fol-

lowed by an operation three days later to remove the appendix, ovaries and tubes, and the gallbladder also for good measure; and this applicant did not admit any illness, hospital treatment or surgical operation!

MORTALITY—Notwithstanding the selection against the Company apparent in the preceding analyses the mortality of non-medical business is on the whole quite satisfactory. We have recently made a comparison of non-medical mortality ratios with mortality ratios of medically examined cases written during the same period at like ages at issue and like forms of insurance. Group and Wholesale are excluded and Preferred Risk, Modified Life and Term policies are also excluded as these forms are not written without medical examination. The results are as follows:

American Experience Table

Year of Claim	MEDICAL			NON-MEDICAL		
	Expected Net Loss	Actual Net Loss	Percentage of Mortality	Percentage of Mortality	Actual Net Loss	Expected Net Loss
1929	2,291,421	1,021,878	44.6	45.0	732,002	1,628,380
1930	2,800,600	1,172,617	41.9	45.9	969,569	2,112,600

NOTE: In a comparison like the above it should be taken into account that a few large claims will materially affect the percentages of mortality. For example, excluding the largest claim included in the above figures for each year would change the percentage of mortality on the medically examined business for 1929 from 44.6% to 40.5% and for 1930 from 41.9% to 38.5%.

It is unfortunate that a comparison cannot be made for like amounts but this is obviously impossible as all small policies in the age groups under consideration are on the non-medical basis unless some suspected impairment suggests the advisability of a medical examination. Taking this fact into consideration one would expect a very favorable mortality in the non-medical group which is also a select class as to age, plan and amount. The comparison however shows the non-medical mortality to be somewhat less favorable than the medical.

An analysis by causes of death follows:

Comparative distribution of claims by causes of death on Non-medical business with Medical and Non-medical combined

Paid In Years 1926-30, Inclusive

Causes of Death	*Non-medical		**Medical and Non-medical	
	Claims	%	Claims	%
Typhoid Fever	8	.4	57	.4
Influenza	51	2.4	323	2.2
Tuberculosis (All Forms)	316	15.1	2,474	16.5
Cancer	120	5.8	1,204	8.0
Cerebral Hemorrhage	37	1.8	408	2.7
Organic Diseases of Heart	159	7.6	1,279	8.5
Pneumonia (All Forms)	176	8.4	1,267	8.5
Other Respiratory Diseases.....	20	1.0	184	1.2
Bright's Disease	81	3.9	767	5.1
Puerperal State	68	3.3	408	2.7
Suicides	72	3.4	568	3.8
Homicides	26	1.3	136	1.0
Auto Accidents	105	5.0	488	3.3
Other External Causes	221	10.6	1,166	7.8
Undetermined Causes	11	.5	71	.5
All Other Causes	616	29.5	4,161	27.8
Total—All Causes....	2,087	100.0	14,961	100.0

*—Excludes Wholesale and Group Conversions.

**—Includes only ages at death 20-49

The non-medical deaths from cancer, cerebral hemorrhage, tuberculosis, organic heart disease and Bright's disease are less than in the medical group; the accidental deaths are more numerous.

Since the non-medical plan was adopted we have kept a record in the Medical Department of all death claims occurring in this class of business. I recently reviewed 1,800 of these claims in an attempt to determine those that might have been avoided had a medical examination been required. I included in the group of preventable claims all cases where the history definitely showed the disease existed when the policy was issued; all deaths from diabetes or Bright's Disease occurring within *two years* of date of application; and *all deaths* from organic heart disease. There were one hundred and fifty such claims divided as follows:

Possibly Preventable Non-Medical Claims

Organic heart disease	64
Tuberculosis	41
Nephritis	17
Diabetes	16
Miscellaneous	12
Total	150

Miscellaneous were as follows—General paresis—three, anaemia—two, acute thyroid disease—two, alcoholism, brain tumor, cystitis, kidney colic, and epilepsy one each.

It is, of course, unreasonable to believe that all of these claims would have been prevented by a medical examination. It is interesting to note by reference to the previous table that the non-medical mortality from tuberculosis, organic heart disease and nephritis is more favorable than the medical mortality notwithstanding the inclusion in the former group of many cases that were suffering from these diseases when the policy was issued.

IV.

What, then, are the advantages and disadvantages of the non-medical plan.

The advantages may be divided into two main groups; first the advantage from the standpoint of agent and applicant. To use a very up to date phrase we may say that the non-medical plan lessens sales resistance in that it saves the time of both applicant and agent and makes it possible to complete the entire transaction at one sitting and without reference to a third party. It thus helps the agent close the business, hastens the issue and reduces the number of not-taken policies.

From the standpoint of the Company the non-medical plan is economical in that it saves the medical fee and reduces the cost of writing small policies; moreover the cost of handling non-medical applications at the Home Office is somewhat less.

The disadvantages of the plan are three in number:

1. The spread of the non-medical plan will gradually reduce very materially the protection now afforded by previous records.

2. The absence of the examination may be used as a sales argument and selection against the Company may thus be encouraged.

3. Improper selection, careless inspection and lack of the protection afforded by a medical examination are bound to result in an increased mortality on non-medical business.

The important points in selection from an underwriting standpoint are nine in number—occupation, residence, habits, moral hazard, plan applied for, family history, personal history, build and physical condition. The first five are in no way dependent upon medical examination; the family history, personal history and build may be determined in a satisfactory manner through the agent if he does his work conscientiously. The physical condition is the stumbling block.

If, however, an applicant has had no serious illness, if his family history is good and he believes himself to be in good health and looks so; if other circumstances such as occupation, habits and moral hazard are favorable he may be given insurance without examination and we may expect a favorable mortality.

Selection against the Company from unfavorable physical condition of the applicant arises chiefly from two sources:

1. Applicants who have no knowledge of an existing medical impairment.
2. Applicants who are aware of and conceal their unfavorable physical condition or fail to reveal important information regarding their physical history.

Fortunately the latter class is not large for most people still believe that truthfulness is a virtue and honesty the basis of a contract.

To the agent belongs the responsibility for selecting non-medical applicants. If the agent is dishonest serious consequences follow for he may easily underestimate the applicant's weight or convince him that his medical history is not of sufficient importance to be recorded. Agents long in a company's employ are loyal to their company and have its interests at heart. New or part time agents often care little for the company they represent. The better the agency personnel in a company writing non-medical

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insurance the better the selection and the better the mortality. Conversely the greater the agency turnover the greater is the danger of an unsatisfactory selection.

By the adoption of non-medical insurance we have to a considerable degree shifted the responsibility for a favorable mortality from the medical to the agency department.

DR. BAKER—Dr. Bartlett has given us a very valuable contribution to our knowledge of the non-medical business. I believe that his Company has shown the experience on the largest single block of non-medical business that has yet been presented to the Association. He states that his Company wrote over \$117,000,000 of non-medical during the year 1930, and this is almost as much as the total amount of non-medical in force in our Company. He also states that his Company has written over 400,000 policies on the non-medical basis and this would indicate that possibly they have in force upwards of \$400,000,000 of this business. This is, indeed, an amount that would enable us to form a very definite opinion as to the expected mortality in such a group.

In October, 1928, we had a very valuable paper from Dr. Scadding on the subject of non-medical, and, at that time, when I presented the experience of our Company, we had written a volume of about \$78,000,000 of non-medical business. Since that time we have written an additional \$126,000,000, making a total of over \$204,000,000 since we first started this business on May 1, 1925.

We have handled 142,534 cases, as follows:

Approved	129,604, or about 90%
Declined	2,472, or about 2%
Withdrawn (incompleted)	2,210, or under 2%
Examination required	8,248, or about 6%

Of the cases ordered examined, we find that over one-half will eventually be approved.

I am attaching, hereto, a photographic copy of our claim experience since May 1, 1925, showing 635 deaths for an amount of \$1,035,000.

Kansas City Life - CLAIM EXPERIENCE - American Experience Table.

POLICY	ALL EFFECTIVE CLAIMS	NON-MEDICAL EXPECTED CLAIMS	ALL ACTUAL CLAIMS	FOR MEDICAL ACTUAL CLAIMS	EXAMINED ACTUAL CLAIMS	PER CENT OF CLAIMS TO EXPECTED NON-MEDICAL EXAMINED	PER CENT OF CLAIMS TO EXPECTED	NON-MEDICAL PER CENT OF CLAIMS TO EXPECTED	PROPERTY AND MEDICAL INSURANCE END OF YEAR	PER CENT OF NON-MEDICAL INSURANCE TO ACT AS AT YEAR
1915	2,341,800	9,176	5,350,000	1,116,818	1,144,818	20.7	20.43	40.75	2,341,817	60.93
1916	3,540,000	103,076	3,131,424	1,048,219	1,040,719	33.8	30.85	38.95	22,871,685	60.73
1917	4,170,000	272,246	3,095,124	1,705,250	1,525,450	41.5	30.40	41.95	45,456,110	64.40
1918	4,556,520	268,773	4,006,932	2,076,917	2,059,817	48.1	38.50	50.73	47,527,000	67.00
1919	4,695,484	463,600	4,338,084	2,328,109	2,047,819	48.3	30.46	52.60	49,333,780	57.11
1920	5,418,340	1,004,000	4,374,360	2,570,440	2,178,440	61.5	30.51	51.63	115,193,160	67.5

This shows that our mortality on the non-medical business has averaged about 30% of the American Experience Table, over a period of six years and eight months, and now stands at 26.4% of that table.

The experience on the medically examined business, over the same period, is distinctly higher, due, of course, to the fact that this group contains all of the larger policies, and older ages.

The combined total mortality of the Company is given in the last column, and for the last six years has varied from 40% in 1925 to 51% in 1929, and now stands at 44%, the total volume in force being about \$450,000,000.

Our rules regarding the acceptance of non-medical business remain the same as in 1928, with the exception that we have raised our limit on male lives to \$5,000 and we now accept married women under this plan for a maximum of \$2,500.

I believe that all states now permit the writing of non-medical business with the exception of Arizona, and our field now covers all of the United States with the exception of New York and New England. However, the greater part of our business is written in the states of the Middle West.

We allow all of the agents of the Company to write non-medical, without exception.

We continue to find that the non-medical plan is of very great assistance to our agents in writing new business, particularly, in the remote rural districts where so much of our Company's business is written. We feel that we have been able to write more business in our territory than we would, had we not employed the non-medical plan.

During the last two or three years unfavorable comment from medical examiners has entirely ceased.

Regarding Doctor Bartlett's comments as to the disadvantages of the non-medical plan:

1. "The spread of the non-medical plan will gradually reduce very materially the protection afforded by the previous record."

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We believe this is true, although, of course, we are making many previous record reports on non-medical business. However, the increasing efficiency of inspection services, I believe, will more than offset this disadvantage.

2. "The absence of the examination may be used as a sales argument and selection against the Company may thus be encouraged."

I do not believe this argument is very often advanced by the agents. From an applicant's standpoint, there are a number of arguments in favor of the medical examination, and I believe most agents will avoid this question altogether in selling non-medical insurance. I might say here, that where an applicant asks for a medical examination, we grant this privilege at the Company's expense.

3. "Improper selection, careless inspection and lack of the protection afforded by a medical examination are bound to result in an increased mortality on non-medical business."

Dr. Barlett's remarks on this proposition are entirely correct. You can secure everything in a non-medical application, with the exception of the physical examination, and when we have all the other points established to our satisfaction, I believe that this last requirement can be waived with entire safety to the Company. Moreover, in every case where we have any suspicion regarding the physical condition a medical examination is required.

In conclusion, I would say that our experience with this business, up to the present time, leads us to hope that we will have a continued favorable mortality in the future.

DR. PATTON—Dr. Bartlett has given us an excellent presentation of non-medical methods and their results for Ordinary business.

The English practice of many years standing was the basis for the Canadian adoption of non-medical in 1921, with modifications as they were deemed advisable. This was followed in 1924 in the United States. We must not forget the differences in the make-up of the populations in the three countries, for life insurance business cannot be above or of higher grade than the surroundings in which it is obtained.

This subject has been discussed at various meetings in Canada and the States since 1921 and we should be beyond the preliminary or trial periods and be in a position to have quite definite opinions.

A review of the business shows, as Dr. Bartlett states, that the 1921 comments of Messrs. V. R. Smith and Henry Moir hit the mark, for the adverse mortality has increased according to the amounts and decreased as the agency selection and instruction have been carefully supervised.

Mr. J. K. Gore, at the 1921 meeting of the Actuarial Society, mentioned the Prudential's practice with reference to non-medical Industrial insurance which they had been writing for a number of years and that they had also started non-medical Intermediate business in 1918. We limited this business then to our Industrial field men, who had been with the company long enough and whose work had been observed closely enough for their Superintendents to recommend them for the privilege of writing non-medical applications.

The factors involved in "Life Underwriting Without Medical Examination" were given by Dr. Henry W. Cook at the 16th Annual Meeting of the Medical Section of the American Life Convention in 1925 and this was followed by a good general discussion. This organization also had an excellent symposium on Non-Medical at their meeting in 1928.

The information in the medical reports from disinterested examiners and the opinions as to the physical insurability of the

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applicants as determined by the medical directors, undoubtedly had much to do with the marked advances during the last twenty years of life insurance selection. The spread of life insurance protection to the sub-standard or underaverage individual could not have been brought about without considerable adverse effect upon the life insurance business if it had not been for the close study by the medical directors and actuaries of the methods and results of physical selection. The medical departments have had much to do with formulating the instructions to agents and the plans for selection of the non-medical business and any company that decreases medical supervision of this business must expect an increase in their mortality experienced.

The companies writing Industrial insurance have a much closer supervision of their agency forces than do those writing Ordinary insurance only, but this is partially neutralized by the latter companies' business coming from an average higher social grade. The details of Industrial insurance require constant supervision to prevent serious errors. A few agents are under an assistant and a number of these groups under a superintendent or manager. The agents' accounts for new and old business are checked almost daily and are generally reviewed at least once a week by the assistant. Meetings are held once or twice a week for instruction and discussion of the company's business methods.

These meetings are frequently attended by Home Office representatives who bring new instructions and review previous ones, calling attention to errors and oversights.

The volume of our non-medical Ordinary has not varied materially since our first full year (1926). During the years 1926 to 1930 inclusive we received about 140,000 applications annually for an average of \$1,200 each or a total of about \$170,000,000. We issued therefore during those five years in the neighborhood of \$800,000,000 of non-medical Ordinary in 700,000 policies.

The applications have averaged 38.5% in number of our Ordinary cases. We have requested examinations (for various reasons) in 6 to 7% of these cases and have received medical

reports in 90% of such requests. Insurance records were the cause of our examinations in approximately 2% and there has been no decrease in this. Other reasons in 4 to 5% of the total receipts called for examinations. We have had to return to the field offices about 30% of the applications and I am sorry to say that there has been very little or no improvement in this direction during the five years. Here is a typical week taken from the early fall of 1930, showing the reasons for returns to the field. There were 628 applications returned out of 1,728 received, or 36.3% :

	Cases	% of Total
1. Application or declaration form not properly completed	130	20
2. Omissions on application	40	6
3. Agent's general report, or woman's questions overlooked	31	5
4. Original declaration form too old (more than a month)	38	6
5. Full medical report required for reasons set forth in the company's published rules: occupation, sex, or kind of policy, above age limit	66	10
6. Details of occupation required	83	13
7. Full medical report required on account of past health, present physical condition, or family record	51	8
8. Full medical report required on account of underweight	53	9
9. Medical information required on account of confidential information	67	11
10. Miscellaneous reasons	69	12
	<u>628</u>	<u>100%</u>

The first five of the above sub-divisions were completely within the agent's control. In other words, in forty-seven per cent., or nearly one-half, of the cases, the delay could be completely eliminated by the agent, while a large percentage of the cases classified under "6" could be speeded up by a complete statement of the details of the occupation in the first instance.

The preceding list of agency imperfections or oversights shows some of the reasons why we need the careful supervision we give the field men and also furnish some of the reasons why our experience has not been better. Another reason for our

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mortality is that practically all our cases come from the industrial classes or where the morbidity and mortality are higher than the remainder of the population.

A summary is given in Table A of the results of our mortality investigation on non-medical Ordinary issues of 1926 and 1927 carried to the end of 1929. This is by amounts but differs very slightly from policies as they averaged about \$1,200 each.

1. The mortality on the Whole Life plan is distinctly unfavorable, while that from Limited Payment and Endowment plans is reasonably satisfactory in the aggregate.

2. The Whole Life mortality is bad above age 35 and is quite unfavorable between 30 and 35 at entry ages.

3. The Limited payment and Endowment policies showed a much worse mortality for ages above than for those below 30.

4. The excess mortality decreases with duration after the second year.

TABLE A
Ax Mortality Investigation (Amounts)

Ratio Actual Deaths to Expected
by

American Men Select Table

WHOLE LIFE								
ISSUE OF 1926								
	15-19	20-24	25-29	30-34	35-39	40-44	45	All Ages
1st	50%	142%	116%	153%	141%	241%	159%	152%
2nd	137	101	86	114	191	242	190	161
3d	91	65	128	122	186	163	148	138
4th	58	71	96	138	179	95	249	122
All durations	86	98	107	131	175	187	185	144

WHOLE LIFE								
ISSUE OF 1927								
	15-19	20-24	25-29	30-34	35-39	40-44	45	All Ages
1st *	74%	106%	104%	173%	162%	207%	226%	149%
2nd	89	118	75	147	190	147	133	135
3d	56	70	96	95	122	164	263	117
All durations	74	100	91	141	160	171	203	134

TABLE A—Continued
LIMITED PAYMENT LIFE

	ISSUE OF 1926							
	15-19	20-24	25-29	30-34	35-39	40-44	45	All Ages
1st	91%	112%	62%	80%	97%	134%	270%	94%
2nd	73	78	26	72	113	87	144	70
3d	76	56	83	123	114	82	199	84
4th	78	70	67	159	95	136	81	91
All durations	79	79	59	106	106	107	172	84

LIMITED PAYMENT LIFE

	ISSUE OF 1927							
1st	100%	74%	94%	99%	146%	200%	—	101%
2nd	104	76	40	77	129	127	—	82
3d	116	75	75	112	87	200	388%	102
All durations	106	75	69	95	121	173	130	94

ENDOWMENT

	ISSUE OF 1926							
1st	82%	88%	58%	100%	125%	174%	244%	94%
2nd	95	80	93	119	130	110	235	100
3d	72	59	66	56	95	109	123	71
4th	97	63	107	131	137	75	—	94
All durations	86	73	80	99	120	115	148	89

ENDOWMENT

	ISSUE OF 1927							
1st	95%	82%	73%	89%	118%	117%	171%	91%
2nd	79	56	67	78	83	68	134	70
3d	63	76	53	86	99	113	157	76
All durations	79	70	65	84	99	97	152	78

The actual loss and the expected loss in the first year on the basis of the A.M.S. table on non-medical Whole Life policies issued in 1926, was as follows:

Age Group	Expected Loss	Actual Loss	%
15-23	\$14,224	\$ 9,671	68
24-33	22,840	30,203	132
34-45	36,316	70,714	193
	<u>\$73,380</u>	<u>\$110,588</u>	<u>151%</u>

These results may be compared with a similar first year's experience on Whole Life policies for less than \$2,000 issued in the years 1923-4-5 with medical examination.

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Age Group	Expected Loss	Actual Loss	%	All business 1925-26
15-23	\$ 25,145	\$ 25,000	99	66%
24-33	55,010	49,785	91	53
34-45	92,023	101,171	110	88
	<hr/> \$172,178	<hr/> \$175,956	<hr/> 102	

The lower mortality of all business for 1925-26 may be due to the inclusion of Limited Payment Life and Endowment plans, to the different periods of time covered or to the fact that the smaller policies have a somewhat higher mortality.

The Limited Payment Life policies gave somewhat more favorable results. The experience taken out during the first policy year and for a portion of the second and third policy years.

Age Group	Expected Loss	Actual Loss	Rates
15-24	\$127,926	\$108,032	84.4%
25-29	58,287	29,364	50.4
30-34	37,172	30,540	82.2
35-39	27,462	29,500	107.4
40-45	20,945	24,500	117.0
	<hr/> \$271,792	<hr/> \$221,936	<hr/> 81.7%

The following was the result on the basis of policy years:

Policy Year	Expected Loss	Actual Loss	%
1	\$127,855	\$ 96,086	75.2
2	125,631	96,500	76.8
3	18,306	29,350	160.3
	<hr/> \$271,792	<hr/> \$221,936	<hr/> 81.7

The experience as a whole was satisfactory on the Limited Payment Life policies although here again the figures indicate that the results become less favorable as the entry age advances.

We do not feel that we could have the Whole Life business over age 30 examined, without having some of the undesirable applicants shifted to Endowment plans, because they could thus still receive non-medical. This was demonstrated by some of our earlier non-medical Endowment results showing 148% of expected for ages 36 and under.

We are at present paying a \$5.00 fee for a complete Ordinary examination. Table B shows what the savings would have been

if we had paid \$5.00 for each examination and secured the mortality as estimated from our nearest comparable groups. This table is made up for examinations from age 30 and up and from age 35 and up. The net savings from the two groups were about the same, hence the extra claims between ages 30 and 35 were approximately covered by the medical fee savings, and the principal loss occurred in ages over 35.

TABLE B

Ax Mortality

Comparison of Estimated Difference in Claims due to Medical Selection with Medical Fees Paid

WHOLE LIFE (ASSUME 100% AM)

Durations	ISSUE OF 1926				ISSUE OF 1927			
	Ages 30 & up Diff. in Claims	Ages 30 & up Diff. in Fees	Ages 35 & up Diff. in Claims	Ages 35 & up Diff. in Fees	Ages 30 & up Diff. in Claims	Ages 30 & up Diff. in Fees	Ages 35 & up Diff. in Claims	Ages 35 & up Diff. in Fees
1	\$ 41,105	\$61,510	\$ 33,746	\$42,605	\$ 50,997	\$71,485	\$38,681	\$48,780
2	51,120		49,248		40,295		32,274	
3	33,930		31,024		23,044		23,044	
4	20,000		16,146					
Total	\$146,155	\$61,510	\$130,164	\$42,605	\$114,336	\$71,485	\$93,999	\$48,780

LIMITED PAYMENT LIFE (90% AM)

1	\$ 6,485	\$48,990	\$ 6,485	\$24,785	\$18,572	\$52,655	\$16,897	\$26,815
2	4,097		4,097		10,007		10,007	
3	11,654		5,225		18,010		14,291	
4	14,762		4,704					
Total	\$36,998	\$48,990	\$20,511	\$25,785	\$46,589	\$52,655	\$41,195	\$26,815

ENDOWMENT (80% AM)

1	\$20,797	\$51,900	\$17,501	\$27,790	\$11,873	\$55,795	\$10,240	\$29,255
2	22,539		14,938		1,677		1,677	
3	7,436		7,436		8,850		7,793	
4	14,622		7,050					
Total	\$65,394	\$51,900	\$46,925	\$27,790	\$22,400	\$55,795	\$19,710	\$29,255

I have noted two comments in previous discussions of this topic that agree with our own experience, namely, higher percentage of not taken and a greater lapse rate for non-medical than medical business.

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Thus, while our experience on the whole is not disappointing neither is it particularly encouraging. Some revision in our plans is under consideration but no decisive action has yet been taken. There probably will be no increase in amounts; there may be changes in kind of insurance and in the age limits; there will be increased supervision in the field and home office care of the business and in the attempts to instruct the agents as to their responsibilities.

This business, like all others, can not rise above its source; hence we must strive to improve the source.

The mortality obtained in non-medical business cannot be improved without better selection by the field force, hence the necessity for careful and frequent personal instruction by both lay and medical departments of the Home Office.

MR. LARUS—Actuaries as well as medical directors will be indebted to Dr. Bartlett for his contribution on non-medical insurance. Not only has he given the extensive experience of his own company, but he has been the means of summarizing the impressions and experience of others in this field.

One cannot avoid the conclusion in reading the paper that the author feels that an extra mortality serious enough to raise doubts in our minds as to the general success of the program has been produced by the elimination of the medical examination. With his figures before us, any of us may delve into them and emerge with our own conclusions. Personally, I feel considerable optimism when one views the situation as a whole.

Of the companies who have not made definite studies into their comparative mortality, 28 regard their non-medical experience as favorable and only 6 as unfavorable. The average excess mortality of the non-medical over the medical among the 15 companies which have made investigations seems to average about 4% of the American Men Select Table, the experience being probably limited to a maximum of about five years. Inasmuch as it is considered probable that whatever extra mortality there may be will occur in the early policy years before

selection wears off, it may be fair to assume that this 4% excess would be produced by extra mortality of 5% the first policy year, 4% the second, 3% the third, 2% the fourth, and 1% the fifth.

The assumption of a limiting amount of \$5,000 under non-medical business produces an average non-medical policy of about \$2,500, so that the saving of the \$5 medical fee gives a leeway of about \$2 per \$1,000. Now a net single premium of \$2 will go a long way in providing for extra mortality in the early years,—on the American Men Select it will take care of extra mortality of 25% the first policy year, 18% the second, 12% the third, 7% the fourth, and 3% the fifth; so that there seems to be considerable margin for profit left.

Dr. Bartlett remarks that in general the more thoroughly the mortality experience on the non-medical is studied, the greater the tendency to find it unfavorable. One cannot avoid the conviction that the companies who very strongly suspect a heavier mortality in their non-medical have been more inclined to compile elaborate studies into it, those in a more placid frame of mind being content with a more cursory investigation, and accordingly being ineligible to be grouped in the class of companies whose findings were definite enough to be quoted.

It is interesting to see how closely the review of non-medical claims in his own company checks with the 4% extra mortality previously noted. He finds 150 out of 1,800 deaths where he suspects that a medical examination would have avoided the loss. This is a little over 8% of his total claims in the non-medical class, and would account for,—since his non-medical business shows a mortality of 45%,—an excess mortality of almost exactly 4%.

Dr. Bartlett has given several tables from his own company's experience which, at first sight, place non-medical business in a more or less unfavorable position. It comes to us as something of a shock that there are about four times as many medical histories and more than four times as many rejections found in medical as in non-medical cases. When we consider, however,

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that the average age of the former is much greater and also that, we assume, a case with an important medical history would not be submitted on a non-medical form, much of the significance disappears.

It is interesting in this connection to note that out of every 10,000 medical cases submitted 36 are rejected because of weight although only 4 out of every 10,000 are rejected for this cause in the non-medical group. While undoubtedly this reflects the tendency on the part of the agent and the company to avoid the use of the non-medical for extremes in weight, it must be confessed that both agent and applicant are likely to minimize wide departures from the normal. In our own Company, in spite of our early warnings on the subject, this leaning became so noticeable that we have requested in no uncertain terms that a penny be invested to procure the exact weight where an even moderate departure from the average might be expected. We still find, however, quite an army of non-medical applicants hovering about, but still safely within, the weight limits.

The comparatively small number of rejections in the non-medical and the fact that no rejections are found by the examiner make it interesting to recast Dr. Bartlett's tables relating to the source of information leading up to rejection. The following revision gives the number of rejections from each cause that would ensue from a group of 1,000 applicants in each of the two groups.

	Medical	Non-medical
Examiner	56	—
Applicant or Agent	6	2
Inspection Report	9	9
Previous record (or in connection with inspection report)	10	6
Miscellaneous	4	1
Total	85	18
Rejection other than through Examiner.....	29	18

Possibly such a revision may make the figures more capable of explanation than when given in the original form.

The 56 rejections by the examiner are, of course, absent from the non-medical business. In fact, one wonders whether the 56

have not been augmented by some where the non-medical form would have been used except for the fact that an impairment was suspected and a medical examination called for. Even, moreover, if the non-medical business had all been examined, no such number of rejections would have occurred, because of the fact that the applicants would all be under age 45, whereas in the medical group a large number are of more advanced years.

From the very fact that a non-medical application was submitted, only a small number of rejections due to statements of applicant or agent would be expected, so that the ratio of 6 to 2 seems reasonable.

Inspection reports result in the same number of declensions in the two groups,—a not surprising result, for while the age and the size of the policy (or both) would suggest a greater number of unfavorable reports among the medical, the inspection report might in some cases bring to light concealments in the non-medical that would be credited to the examiner in the medical.

Previous records are obviously of much greater frequency in connection with policies of large amounts and at high ages, so that the ratio of 10 to 6 is not surprising; nor is the 4 to 1 split in the miscellaneous group, when one takes into account its composition,—those with previous rejections and cases of over-insurance.

With these facts in mind, the figures quoted in the paper seem to conform quite closely with what would be expected from any two groups of applicants similarly constituted as to age and financial status.

The analysis of claims by cause of death given in the paper is very interesting. The results show that the deaths from cancer, cerebral hemorrhage, organic diseases of the heart, tuberculosis, and Bright's disease form a greater percentage of total deaths in the medical than in the non-medical group. This, however, seems readily explainable by the fact that the medical group as a whole were taken from policies which were in force much longer and therefore more subject to chronic disease, being

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further away from the influences of initial selection. It will be similarly noted that deaths from acute causes form higher percentages in the non-medical section.

All in all, the non-medical venture seems to have paid its way. Possibly the companies would have been wiser had they initially adopted an upper limiting age of 40 instead of 45, for with advancing age a medical examination is more prone to discover impairments and the saving of the medical fee does not assume so great an importance in comparison with the expected cost of mortality. Even at the middle ages of the non-medical group, the issuance of a \$10,000 policy without examination spreads the saving in fees very thin, while the issuance of a \$5,000 policy may be considered risky unless a company's agents are under good control and as a whole quite reliable, for, as Dr. Bartlett emphasizes, a great deal of the success of the whole program depends upon the agent. In fact, one may be excused for suspecting that the questions of agency organization and training of agents are almost entirely responsible for the wide variations in the experience of the different companies quoted in this paper.

DR. JAQUITH—In a discussion of Dr. Scadding's paper "A Mortality Investigation of Male Lives Accepted Without Medical Examination", at the October, 1928, meeting of the Association, my Company's practice in writing insurance without examination was outlined. Since that time our experience has continued to be favorable.

Approximately 90% of applications were acted on as submitted, and for various reasons, such as sex, age, insurance record, information in application, inspection report, plan of insurance, etc., examination was asked for on the remainder. In 2.8% of cases, medical examination reports were not obtained and applications were postponed pending receipt of medical reports. Approximately 1% of applications were declined without calling for examination. For five and one-half years, the approximate annual saving in medical fees was \$25,000, and total amount of claims during that period was \$82,950.

In claims occurring in the *first policy year*, 44.8% deaths were due to violence, and 55.2% to disease. Of the deaths due to violence, 15.4% were suicides, 53.8% were caused by automobile accidents, and 30.8% were due to miscellaneous accidental causes.

Of the deaths occurring during the *second policy year*, 27.8% were due to violence, and 72.2% to disease. Among the deaths due to violence, there was one suicide, one aeroplane accident, and three miscellaneous accidents.

In the *third policy year*, 25% of the claims were due to violence, and 75% to disease. Among the deaths due to violence, there were no suicides or automobile accidents.

In the *fourth policy year*, there were three claims, one due to automobile accident, one to acute disease, and the other to cancer of the stomach.

In the *fifth policy year*, there was but one claim in which death was due to disease of an acute character.

A survey of non-medical applications 1926 to 1930, inclusive, shows the ratio of first year non-medical terminations to issues as 27% compared with 21% of first year medical terminations to issues.

MORTALITY EXPERIENCE FOR 1930

	Expected (Amer. Men)		Actual		Actual Per Cent. of Expected	
	Pols.	Amt.	Pols.	Amt.	Pols.	Amt.
All Issues—First Year	72	\$165,051	29	\$84,500	40.28	51.20

NON-MEDICAL

	Expected (Amer. Men)		Actual		Actual Per Cent. of Expected	
	Pols.	Amt.	Pols.	Amt.	Pols.	Amt.
First Year	18	\$24,338	6	\$ 9,500	33.33	39.03
More Than One Year..	41	56,512	19	26,500	46.34	46.89
TOTAL	59	\$80,850	25	\$36,000	42.37	44.53

We made an investigation of issues for the years 1926 to 1930, inclusive, to determine the percentages of Medical and Non-Medical. The result is set forth in the following Table:

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Year of Issue	Percent of total number of policies issued	
	Medical	Non-Medical
1926	77	23
1927	65	35
1928	58	42
1929	59	41
1930	62	38
Average for five years	73%	27%

Of the disability claims incurred during the five years, 71% were on policies issued with medical examination, and 29% were on policies issued without medical examination.

It is remarkably striking how evenly the percentage in each class runs in that 73% of the policies were issued on medical examination, and 27% without examination, and 71% of the disability claims incurred were on medical cases, and 29% on non-medical.

DR. LIVINGSTON—The Mutual Life Assurance Company of Canada leaves it optional to the agent as to whether an applicant should be written on the non-medical plan or with medical examination. It requires a sample of urine, to be examined in the Head Office Laboratory, and an Inspection Report with each non-medical application. Neither of these are required for the corresponding amounts of medically examined business.

The following investigation is a comparison of the results under the Company's non-medical business with those on its medically examined business for the same years of issue, the same ages at issue and the same amounts of insurance. The Company introduced the non-medical plan in 1923, and the limit of the amount of acceptance from 1923 to 1925, inclusive, was \$2,000, and from 1926 onward, \$5,000. Only those between ages 15 and 45 are considered. The experience is taken to the policy anniversary in 1930.

Expected deaths have been calculated by the Canadian Men Select Table, 1900-1915. The investigation covers 13,996 policies for \$19,671,000 on the non-medical basis and 57,141 policies

for \$112,297,000 on the medical basis. Thus, about one policy in six of those which could have been written non-medically was so written.

EXPERIENCE BY POLICY YEAR

	Number of Deaths (Policies)	Ratio of Actual to Expected Deaths	
		By Policies	By Amounts
1st Pol. Yr.			
Non-medical	15	41%	48%
Medical	104	66	64
2nd Pol. Yr.			
Non-medical	23	67	69
Medical	113	70	65
3rd Pol. Yr.			
Non-medical	13	50	47
Medical	80	58	54
4th Pol. Yr.			
Non-medical	8	42	40
Medical	67	60	61
5th, 6th & 7th Pol. Yrs.			
Non-medical	13	59	59
Medical	84	54	51

EXPERIENCE BY AGE AT ISSUE

Age at Issue 15-19			
Non-medical	17	65%	55%
Medical	75	69	68
Age at Issue 20-29			
Non-medical	28	53	59
Medical	142	59	59
Age at Issue 30-39			
Non-medical	17	44	49
Medical	144	63	63
Age at Issue 40-45			
Non-medical	10	49	48
Medical	87	59	53

EXPERIENCE BY YEAR OF ISSUE

Issues of 1923-4-5			
Non-medical	38	59%	63%
Medical	246	58	57
Issues of 1926-7-8-9			
Non-medical	34	46	47
Medical	202	67	62

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GRAND TOTAL

	Number of Deaths (Policies)	Ratio of Actual to Expected Deaths	
		By Policies	By Amounts
Non-medical	72	52%	54%
Medical	448	62%	60%

DISCONTINUANCE

At End of Yr.	By Policies Non-medical	By Policies Medical	By Amounts Non-medical	By Amounts Medical
1	18%	12%	17%	11%
2	3	3	3	3
3	2	2	2	3
4	3	3	3	4
5	3	3	3	3
6 & 7	3	3	3	3
3-7	3	3	3	3

RATE OF BECOMING DISABLED

Section	Number of Claims	Rate per 1,000	
		Policies	Amounts
Non-medical Standard	19	1.8	2.1
Medical Standard	168	3.4	3.5
xNon-medical Sub-standard	6	6.2	5.6
xMedical Sub-standard	21	7.9	6.4

xIn the Sub-standard Sections the exposed to risk were multiplied by the rating used so that the Rate per 1,000 shown above should be multiplied again by the average rating on the disability clauses.

Out of 100 Disability Claims admitted at end of three months of total disability, the number surviving and remaining disabled are as follows,—

Section	End of Six Months Total Disability	End of Twelve Months Total Disability
Non-medical Standard	50.5	28.1
Medical Standard	58.6	31.7
Sub-standard Medical and Non-medical combined	70.4	43.9
Class 3	?	35.2 to 45.0

Observations:

1. The non-medical experience as a whole was considerably better than the medical. Of the eleven sections into which we have divided the business, only three show a higher mortality under the non-medical business than under the medical, and of these three, one section, namely, the experience for the 5th,

6th and 7th policy years, is contained in total under another of these three sections, namely, the experience for Years of Issue 1923-4-5.

2. The non-medical experience by amounts slightly exceeds that by policies whereas under the medically examined business the reverse is the case. This condition of affairs exists also in the majority of sections.

3. In the first policy year, the non-medical business shows a particularly favorable experience.

4. In the division of the experience by age of issue, the superiority of the non-medical lives is greater in the age groups over age 30 than in those below age 30.

5. The non-medical selection for the years 1926-7-8-9 is considerably superior to that for the years 1923-4-5.

6. Discontinuance rates on non-medical at the end of the first year are much higher than the medical, but after the second year premium has been paid, there is little difference.

7. The non-medical group have shown a lower rate of disability claim than has the medical group. An interesting point in this regard, however, is the percentage of claims occurring in the first year, which are nearly twice as great for non-medical business as for the medical.

8. In both the non-medical and medical groups, the lives taken at sub-standard rates for disability benefit showed a very bad experience. It might be stated that the material used here was composed of the policies which were accepted standard for insurance but sub-standard for disability (on account of occupation or medical impairment).

Comments:

1. While it is a foregone conclusion that if our non-medical group had been medically examined we would have eliminated certain cases, and thus have secured a better experience than we had, yet the figures show that our non-medical selection has been very effective. We would give the chief credit for this to three causes,—

Discussion—Life Ins. Without Med. Exam. 159

- (a) The care exercised by the Agency Force in writing non-medical business.

The Agency Manager is held responsible for choosing those of his agents who will have the right to write non-medical business. No agent is entitled to write non-medical business who has not been with the Company at least six months.

- (b) The sample of urine which must be sent to Head Office to be examined by our Technician.
- (c) The Inspection Service.

The improvement of the later non-medical business over that written in the earlier years is probably largely due to the improvement in this last cause.

2. There has been a definite selection against the Company on the part of some assured who have taken the larger amounts under the non-medical business.

3. The unusual care taken by the Agency Force in taking their non-medical business at the higher ages has more than counteracted the danger of writing non-medical business at these ages due to the beginning of degenerative diseases.

In this connection, it might be stated that the proportion of business written non-medically at the higher ages was smaller than at the younger ages.

4. The discontinuance rates at the end of the first year would indicate that there is a section of business sold non-medically which is not as firmly placed as the medical business, these lives being undoubtedly those who will not bother to get a medical examination in order to secure the insurance. It would seem that these all disappear when the first renewal premium falls due.

5. The disability clause for small amounts on the non-medical basis need not cause us any particular concern, but it is otherwise with business at sub-standard rates for this benefit whether medically examined or not.

SECOND DAY

President Rowley in the chair.

The Secretary announced that he had cast a ballot as instructed for the election of the officers and members of the Executive Council placed in nomination on the preceding day, as follows:

President—Dr. Charles L. Christiernin.

First Vice-President—Dr. Lawrence G. Sykes.

Second Vice-President—Dr. H. Crawford Scadding.

Secretary—Dr. Edwin G. Dewis.

Treasurer—Dr. Albert O. Jimenis.

Editor of the Proceedings—Dr. Robert A. Fraser.

Members of the Executive Council—Dr. Morton Snow, Dr. Eugene F. Russell, Dr. Ross Huston, Dr. Chester T. Brown, Dr. Samuel B. Scholz, Jr.

These officers and members of the Executive Council were declared duly elected.

DR. ROWLEY—Before we begin our scientific program of the presentation of papers and discussions, I want to introduce a friend of mine and I have asked him to say just a word to you. He is a modest sort of fellow and doesn't want to say anything, but he has yielded to my persuasion.

When a person or a group of persons has accomplished something that brings a feeling of pride, it is natural for those persons to want others to know about it, and especially do they want their friends to know about it. The medical profession as a whole knows comparatively little, it seems to me, of what this Association has accomplished through research and study of the enormous amount of data at our disposal. The average physician engaged in the practice of medicine has as his first concern the restoration of his patient to a state of comfort and of renewed earning capacity, and he is not so much interested

as are some others in knowing what may be expected as late effects from a particular illness or a particular condition or sign discoverable by examination. The life insurance companies, more than any other one agency, have made clear to the public and to the profession the fact that too much *avoirduois* means too much risk in terms of good health and long life. The life insurance companies were early to recognize the value of blood pressure observations, and as those examinations soon became a universal requirement of the companies, the doctors throughout the land were stimulated, if not forced, to know something about it. With regard to systolic heart murmurs, we all realize that the interpretation by the non-insurance doctor is not in accordance with our interpretation of it. The non-insurance doctor says it does not mean heart disease and no lesion can be demonstrated on post mortem examination and that therefore it is of no importance. We know that, whether heart disease or not, too many of them die before their time and the mortality is decidedly higher than normal, and so with us the dollars and cents argument prevails.

Dr. D. Chester Brown for many years has been a prominent figure in medicine in this state, an ex-President of the State Medical Society, a man who has been kept in active service on some of the Society's most important committees. It has been my good fortune to be associated with him in a good deal of that committee work. For a number of years I was a member of the Board of Registration of Medicine in this state, and for more than ten years its Secretary. In Connecticut we had and still have several examining boards, one for the regular schools and one for the other schools of medicine, and one for each of the cults licensed to practice. One of the other medical boards, according to reports that came to our notice some few years ago, was doing things that looked strange and that seemed to us to call for some explanation. Dr. Brown was one of three or four of us who called on the Governor to tell him the situation. Although the Governor was impressed with the fact that all was not well, no action in the matter was taken until about

a year later, when a reporter from a newspaper in St. Louis came to town and there was laid before the Governor some of the scandals that were going on. Promptly a grand jury was instituted and its investigations and disclosures were printed in the press throughout the land and read by most of you, but you no doubt have forgotten about it. Dr. Brown's wise counsel was freely sought throughout that corrective period in medicine in this state.

Connecticut, however, could not lay claim to all of his time and talents, as he already had been in service in national medicine for a number of years as a member of the Board of Trustees of the American Medical Association. May he continue to serve in that capacity for a number of years to come.

I invited Dr. Brown to attend this meeting, to mingle with us and get acquainted with us and with our work. You all feel as I do, I am sure, that it is a pleasure to have him here as a member of the highest official body in American medicine and an added pleasure to have him here as Dr. Brown. I have the honor to call upon Dr. D. Chester Brown, of Danbury, Trustee of the American Medical Association. (Applause.)

DR. BROWN—Mr. President, I think you have given me a much finer obituary notice than I could write for myself, and I thank you very much for it. You all know Dr. Rowley and it is unnecessary for me to draw attention to how much you should discount of what he has said, but it is a great pleasure to meet with you gentlemen and to have had the opportunity to hear a part of your program. I was present yesterday afternoon and I was impressed with the fact that you gentlemen in your organization have so much and detailed information, statistics, that never come to the practising physician and that in some way should be gotten to him in order that he may properly evaluate the work that he is doing and the basis for his coming to certain conclusions, to determine whether he is right or whether the conclusions are not warranted. Your hard cold facts are really a great analysis of what the medical profession

has been trying to accomplish, and in many instances it paves the way for new work. It is one thing to take the bull by the horns; it is another thing to take him by the tail; but whichever end you take the bull by, you don't know just what to do with him after you have gotten him.

Now you have all this information and are you getting it to the group to whom it should come, to those practising medicine in the field and to the public at large? We have in the American Medical Association a scientific exhibit where many things are presented that could not be presented in papers in the scientific sections and it is essentially an educational feature of the annual meeting of the American Medical Association. We have had some statistics presented from single insurance companies, but when this paper was presented by Dr. Hunter yesterday, I was so impressed with the suggestion that he made of having this committee make an analysis of work based on the grouping of your different insurance companies that it seemed to me if we could bring about co-operation between your organization and the A. M. A., and get that information annually before the medical profession, we would accomplish an enormous piece of work. I would like to suggest to you, Mr. President, and to your Executive Committee, that you make arrangements to get in touch with the Committee on Scientific Exhibits and see what can be accomplished in this way, see if we can't do a real constructive work in bringing about a dissemination of this information that you have acquired, that we don't get in any way, even when we go out and attempt to have an evaluation of subjects made.

Another thing I was impressed with was the entire character of the program. The headquarters of the American Medical Association has been very much disturbed about these national organizations in one branch or another branch of medicine that have been correlated with general practice, and it seems too bad with all the influence that your organization has, with all the influence it exerts in determining values, that we as a national organization, the American Medical Association, should

not have the benefit of it. It would seem to me that it would be well worth while for your Executive Committee also to bear this in mind and see if you could not devise some way by which you could be brought in closer touch with this organization.

Are you aloof? Are you drifting away from the profession at large? Do you feel independent entirely of them? Do you feel that you don't have to contribute to their advance? We would like to see very much all of these national organizations so tied up with the American Medical Association that the profession at large would have the benefit of their work.

I thank you very much, sir, for the opportunity of coming to meet with you and I hope that we will be able to hear from you in regard to some of your work. (Applause.)

DR. ROWLEY—I want to thank Dr. Brown for coming before us and making those friendly remarks to us.

THE VALUE OF ELECTROCARDIOGRAPHY IN MEDICAL UNDERWRITING

By H. F. TAYLOR, M. D.

Associate Medical Director Aetna Life Insurance Company

The valuation of cardiovascular cases continues to be a dilemma to the sub-standard underwriter. In spite of increased care in selection and the gradual stiffening of ratings, we still find ourselves "in-the-red" on this group. Unless some method is evolved by which we can improve our experience, it is not impossible that we may find it necessary to discontinue underwriting cases in which cardiac pathology is found.

Obviously we cannot evaluate individual cases, as they come to us, as can the trained cardiologist who has the benefit of an accurate history—past and present—and uniformly good clinical examinations. But we can have whatever benefit there is to be derived from the less important *instrumental* aids to diagnosis, which, we are convinced, have been too little used to the present time.

Electrocardiography is a comparatively recent addition to our diagnostic armamentarium. Einthoven brought out the string galvanometer in 1903. There was considerable delay in recognizing its importance as a diagnostic aid and only in the last 10 or 12 years has its use been general in cardiac studies. Now no cardiovascular examination is considered complete without an electrocardiogram; and still in the minds of the profession at large the whole subject of electrocardiography is surrounded by a cloud of mysticism which has been penetrated by only a few brainy individuals—the cardiac specialists. The sooner this haze of ignorance is cleared away and the value of the electrocardiogram as a diagnostic aid appreciated, the better it may be for our underwriting statistics. Further than that—the absolutely definite findings of the electrocardiogram in medical underwriting, with the resulting volume of statistics, will be of untold value for (1)

not only the further development of electrocardiography but (2) as an aid to the accurate underwriting of hitherto unstudied heart lesions. At present the generally accepted normal electrocardiogram is based on the study of two series of normal hearts—52 by Lewis and 26 by Pardee—totaling only 78 cases. A series of several thousand cases might show, in fact we feel will show, that what we accept as normal limits will be subject to revision from the underwriting standpoint.

About two years ago we began a study of our cardiac cases in which we had obtained electrocardiograms. This was started with a two-fold purpose in mind—(1) to determine what our experience had been and if indicated to revise our underwriting practises; (2) to attempt to stimulate interest in the subject among medical underwriters generally in hopes of getting uniform statistics which would later be of use to us all.

The series of cases we have to report is too brief and the time interval insufficient to be at all conclusive but nevertheless we feel it is sufficient to give some indication of the importance of electrocardiography in our work and will serve as a basis for further study of the subject.

We are indebted to Dr. Robert S. Starr of Hartford, who personally reviewed all the cases studied and gave us the benefit of his experience in the interpretation of the electrocardiograms.

Two groups of cases were reviewed as a basis for this report: (1) 229 cases from the Ætna files; (2) 778 cases from Dr. Starr's files. This latter group we feel is of especial value in that they are all private cases in which the whole record including history, physical, orthodiagram, and electrocardiogram were completed by him. Of these 1,007 cases studied we were able to get "follow-up" reports on 742 cases and we have based this report on study of only those cases in which we have absolute knowledge of their present condition. All of these cases were first seen and studied in the years 1924 to 1929, giving only a period of two to seven years' observation.

In this study of 742 cases we have directed our investigation along the following lines:

1. ARHYTHMIAS

- a. Premature Contractions.
Ventricular—Junctional—Auricular.
- b. Heart block.
- c. Sinus arrhythmia.
- d. Auricular Fibrillation.

2. Q. R. S. CHANGES

- a. Duration .08 sec.
- b. Duration .08-.1 sec.
- c. Duration over .1 sec.
- d. Slurring.
- e. Presence of Q waves.

3. T. CHANGES

- a. Coronary T.
- b. Neg. T—Leads I and II.
- c. Slanting T.

1. ARHYTHMIAS

- a. Premature Contractions.

We found 129 cases which showed premature contractions. 20 deaths occurred in this group. The origin of the contractions varied as follows:

Ventricular Premature - 88 cases with 16 deaths
Junctional Premature - 15 cases with 3 deaths
Auricular Premature - 26 cases with 1 death

This comparison is of interest in view of the early belief that auricular premature contractions were of more serious moment than ventricular premature contractions.

Of the whole group of 129 cases:

58 cases with 14 deaths were from Dr. Starr's series.

71 cases with 6 deaths were from the Ætna files.

Analysis of the 14 deaths in Dr. Starr's series revealed that:

8 cases showed T changes in Leads I and II.

3 cases, including one of above, gave definite history of precordial pain—either angina or coronary occlusion.

4 cases showed aortic disease with sclerosis and hypertension.

No deaths occurred in Dr. Starr's cases which were clear otherwise in the electrocardiogram, history, or physical findings.

In the six cases that died from the Ætna series, the past histories were all negative. 1 case showed double mitral lesion; 1 case of hypertension - 4 cases nothing abnormal was discovered.

- b. Heart Block—only six cases with one death were found.
 - 4 cases of sino-auricular block - all living 4 years.
 - 1 case of partial block - living 2 years. T changes were also found.
 - 1 case complete block died - this case also showed T and Q. R. S. changes.

Obviously no conclusions can be drawn from this.

- c. Sinus Arrhythmia.

Only 5 cases were found in which this type of irregularity was of sufficiently marked degree to be appreciated clinically. No deaths occurred in this group. The age incidents were 11, 42, 47, 56, 62.

The question has been raised as to whether sinus arrhythmia in the older ages might not have some significance as indicating myocardial change. Our statistics so far throw no light on the subject.

- d. Auricular Fibrillation.

A total of 35 cases with 10 deaths showed this type of irregularity.

Of these, 27 cases with 8 deaths were from Dr. Starr's series.

8 cases with 2 deaths were from Ætna files.

Analysis of the 19 living cases in Dr. Starr's series showed:

10 cases associated with mitral stenosis.

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8 cases associated with arteriosclerosis and hypertension.

1 case showed no other abnormality - a man, age 24, with a history of palpitation sudden in onset - past history negative except a Neisserian infection and chancroids - Wassermans negative.

One unusual case was noted in this group where definite angina was associated with fibrillation.

Of the 8 cases with 2 deaths from the Ætna files:

5 cases (including the deaths) showed T changes in Leads I and II.

1 case in poor health has an old heart history.

2 cases showed no other abnormality - past history and physical findings were clear.

As stated before, the volume of cases studied, together with the time interval, is altogether insufficient to allow of any reliable conclusions. This is especially applicable to the questions of sinus arrhythmia and heart block; but for our present underwriting purposes and for a foundation on which to base further study, we have drawn these conclusions relative to cardiac irregularities:

- a. Premature contractions, regardless of origin, frequency of age of the patient, in the absence of any other pathological evidence, have no significance as indicating myocardial change.
- b. Sinus arrhythmia and sino-auricular block of themselves do not indicate myocardial damage. The question of their significance in the older ages should be further investigated.
- c. Heart block of any degree or interventricular block are all indicative of myocardial damage and call for rejection.
- d. Auricular fibrillation practically always is associated with definite cardiac pathology and should call for rejection.

II. Q. R. S. CHANGES

The present accepted normal upper limit of the Q. R. S. interval is given as .1 sec. In this study we have reviewed those cases showing a Q. R. S. interval of .08 sec. or over.

a. Duration .08 sec.

We found a total of 34 cases with seven deaths, of which 23 cases and 6 deaths were from Dr. Starr's series.

11 cases and 1 death was from the Ætna files - mortality 20%.

Of the 6 deaths in Dr. Starr's cases—

4 were due to cardiac causes.

1 ruptured gall-bladder.

1 suicide.

All of the 23 cases of Dr. Starr showed other evidence of cardiac trouble either by physical findings, T changes in Leads I and II, or in past history. (6 cases had history of precordial pain of angina or coronary occlusion type.)

Of the 11 cases from the Ætna files all but two cases showed other evidence of cardiac trouble either on physical examination or by electrocardiographic changes. The surprising thing in the review of this group was that so few were normal in all respects - (only 2 cases of the 34 reviewed and these were in the Ætna series).

b. Duration .08-.1

A total of 26 cases with 9 deaths was studied - mortality 37.5%

Of these, 19 cases with 9 deaths were from Dr. Starr's series.

7 cases and no deaths were from Ætna files.

Analysis of Dr. Starr's 19 cases with 9 deaths:

All the deaths were due to cardiac causes and every one of the 10 living cases showed evidence of definite cardiac pathology.

3 give history of pain (angina or coronary).

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- 3 enlarged hearts with hypertension.
- 2 showed T changes in Leads I and II.
- 1 chronic nephritis and failing compensation.
- 1 aortic and mitral lesions.

Of the seven cases from the Ætna files—

- 2 cases showed chronic valvular lesions.
- 2 cases showed hypertension.
- 3 cases in which nothing remarkable was developed.

In this group of 26 cases only three were clear in all respects and these three were from the Ætna files.

c. Duration over .1 sec.

A total of 36 cases with 15 deaths - mortality 41.7%.

Of these, 26 cases with 13 deaths were from Dr. Starr's files.

10 cases with 2 deaths were from Ætna files.

All of the deaths in this group resulted from cardiovascular causes, 12 of the 36 cases showed marked hypertension.

Of the 13 living cases in Dr. Starr's series—

- 4 showed T changes in Leads I and II.
- 1 case of 2° heart block.
- 1 case has attacks of paroxysmal fibrillation.
- 1 case congenital heart defect.
- 1 case chronic nephritis and hypertension.
- 5 cases show definite slurring of Q. R. S. as the only additional change. Three of these five cases are known to be in poor health.

Of the 8 Ætna cases living—

- 2 cases have chronic valvular disease.
- 2 cases show T changes Leads I and II.
- 1 case gave history of heart block in past.
- 1 case, man 65 years, showed auricular premature contractions and sino-auricular block.
- 2 cases showed no other changes from normal.

d. Q. R. S. slurring.

Slight bowing or slurring of the R and S waves in one or two leads was a common finding and apparently in itself of no significance. We felt, however, that persistent slurring in all three leads might be considered abnormal.

Such slurring was found in 74 cases with 29 deaths—39.2% mortality.

Of these, 62 cases with 28 deaths were from Dr. Starr's series.

12 cases with 1 death were from Ætna files.

These cases showing slurring were further divided as to time interval of the Q. R. S.:

Constant slurring in all three leads with—

1. Time interval of less than .08 sec.

We found 24 such cases with 10 deaths.

Of the deaths—

8 were cardiovascular deaths	{	6 Showed T changes in Leads I and II.
		1 deep Q3.
		1 no other electrocardiographic changes.

1 died from cancer of Pancreas.

1 cause of death unknown and no other abnormalities noted on electrocardiogram.

Of the 14 cases living—

11 showed no other abnormalities on electrocardiogram or physical examination.

2 living three years show T changes Leads I and II.

1 living has mitral stenosis and a P-R interval of .22 sec.

2. Time Interval of .08 sec.

There were 13 such cases with 4 deaths.

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Of the deaths—

2 were cardiac deaths - both showed T changes in Leads I or II.

1 ruptured gall-bladder.

1 suicide.

Of the 9 living, there were no other electrocardiographic changes, but—

2 have definite history of angina.

7 showed physical signs of cardiovascular trouble as by valve lesions or hypertension.

It was of interest that every case in this group showed evidence of cardiovascular pathology.

3. Time interval of .08-.1 sec.

There were 9 cases with 5 deaths.

Of the 5 deaths, 3 showed T changes Leads I and II.

1 hypertension 214/110.

1 nothing else abnormal noted.

Of the 4 living, 2 show T changes Leads I and II.

1 hypertension 230/120.

1 normal.

4. Time interval of over .1 sec.

There were 16 cases with 10 deaths

All of the cases that died showed T changes in Leads I and II.

Of the living cases—

2 give history of angina and show T changes Leads I and II.

1 congenital heart defect.

3 were clear in all other respects.

Of the 12 cases with 1 death in the Ætna series—

6 cases showed T changes Leads I or II.

4 showed evidence of pathology either in physical or past history.

2 cases were clear in all respects - these 2 occurred in the group of Q. R. S. less than .08 sec.

Conclusions on Q. R. S. changes.

Ninety-six cases with 31 deaths - mortality 32% - showed a Q. R. S. interval of .08 sec. or over - only 7 cases of this group were clear in all other respects - history, physical findings, or electrocardiographic findings - and these 7 were from the Ætna series.

Any case in which the Q. R. S. interval reaches .08 sec. should be studied carefully. For our purposes, the finding of a Q. R. S. interval of .08-.1 sec. should in most cases call for rejection. Only those cases in which the history is clear and we have unquestioned physical findings should be considered. Certainly an interval of over .1 sec. calls for rejection.

Slurring of the Q. R. S. group in all three leads is often associated with cardiovascular pathology and such cases should be carefully reviewed. Only 11 of 24 cases in Dr. Starr's series where the Q. R. S. intervals were under .08 sec. were clear in all respects. Slurring associated with Q. R. S. intervals of .08 sec. or over does not seem to alter the picture materially and such cases can be handled as previously recommended under increased time interval.

- e. Q Waves - were noted in only 5 cases in the whole series - 4 cases with 2 deaths in Dr. Starr's series, 1 case which died from Ætna files. All 3 deaths were cardiac. Of these,

- 2 cases showed deep Q3, i.e., more than 1/4th greatest amplitude of Q. R. S. in any lead.

- 1 case showed deep Q2 and Q3.

The 2 living cases showed small Q2 and Q3 respectively, i.e., less than 1/4th greatest Q. R. S. deviation.

No conclusions can be drawn from such a report, but these few cases fall in line with the conclusions of Pardee and Willius that a deep Q3, i.e., 1/4th or more of the greatest Q. R. S. deviation in any lead is indicative of myocardial damage and so should call for rejection. In this connection, we have had several tracings recently

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submitted to us by outside Examiners as normal electrocardiograms which have shown to us the presence of "pathological Q3 waves".

III. T CHANGES

No attempt has been made to differentiate T changes in low, diphasic, isoelectric, or negative T waves as these have been found in various combinations in given cases. All cases showing variations from the expected erect and rounded T wave of at least 2 m.m. amplitude have been included. T changes in Lead 3 were noted in fully one-half of all cases reviewed and obviously were not significant, so only those cases showing T changes in Leads I and II are included in this group. The only exception was the peculiar T change referred to by Pardee as the coronary T wave which was included regardless of the Lead in which found.

a. Coronary T Waves.

This type of T wave was noted in 30 cases with 17 death—mortality 56.6%.

Of these, 29 cases with 17 deaths were from Dr. Starr's series.

1 case living from Ætna files.

10 of the deaths in this group occurred within one year.

Analysis of the 12 living cases in Dr. Starr's series shows:

5 have angina pectoris.

6 show damaged hearts on physical examination.

1 case reporting good health has a luetic history of 10 years duration.

The one living case in the Ætna series has aortic and mitral lesions. Needless to say he was rejected for insurance.

b. T changes in Leads I and II (other than coronary).

There were 104 cases with 48 deaths in this group - mortality 46+-%.

Of these 83 cases with 43 deaths were in Dr. Starr's series.

21 cases with 5 deaths were from Ætna files.

Analysis of the 40 living cases in Dr. Starr's series shows:

- 15 cases give a history of attacks of precordial pain either angina or coronary occlusion.
- 8 cases were definitely known to be on digitalis.
- 11 cases show cardiovascular troubles in various combinations, as auricular fibrillation, arteriosclerosis and hypertension, or definitely failing compensation.

Only 6 cases of the 40 living cases claim definite improvement or freedom from symptoms:

Of these—

- 2 cases living 7 and 2 1/2 years have congenital heart deformities.
- 1 case living 6 years became symptom free after a nephrectomy.
- 1 case living 2 years, woman 31 years old, had subacute arthritis at the time.
- 1 case living 6 years is a diabetic. T waves were low—under 2 m.m.
- 1 case living 4 years, girl age 18 years, no pathology was detected.

Analysis of the 16 living cases from Ætna series shows:

- 13 have cardiocascular defects as valve lesions - arteriosclerosis or hypertension in various combinations.
- 1 case of congenital dexterocardia.
- 2 cases in which no pathology was detected.

c. "Slanting T waves".

A peculiarly formed T wave was frequently noted in which there was an absence of the S-T interval - the wave rose sharply from the base line to apex and lacked the rounded curve of the normal T. It was occasionally seen in a single lead where the T's in other leads were definitely abnormal. The significance of this type of wave was not clear and we were unable to find any mention of such a T wave in the literature.

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In Dr. Starr's series 8 cases, ages 11 yrs. to 73 yrs., showed this type of T wave as the only T variation in any lead and occurred in one, two, or three leads. All of these 8 cases are living, one, three years and seven over four years. Five cases in the group complained of chest pain of non-cardiac origin. None of the eight cases showed any cardiovascular pathology and seven are now in good health - one case, a woman age 73, is in poor health for other reasons not stated.

Conclusions relative to T changes:

T changes of the coronary type in any lead are practically never seen except when associated with myocardial damage and its finding calls for rejection of the risk. T changes (other than the coronary type) in Lead 3 alone are of no significance and can be considered normal.

T changes in Leads I and II usually mean one of two things: either (1) Digitalization, indicating prescribed treatment for myocardial weakness or (2) Myocardial changes. Both conditions call for rejection of the risk.

T slant of itself is apparently of no significance as indicating myocardial change.

Before closing there are a few points we wish to emphasize:

Electrocardiography is only an aid to diagnosis of cardiac pathology and can never be used to take the place of good history and reliable physical examination - a badly damaged heart may give a normal electrocardiogram. It does not tell you of the presence or absence of valve lesions. On the other hand, an electrocardiogram will occasionally show evidence of serious damage to the myocardium which is not appreciated clinically. An electrocardiogram will definitely record arrhythmias (if present at time of examination) and differentiate the benign from the serious types.

We sincerely hope that this brief review may stimulate interest in the subject of electrocardiography as applied to medical underwriting, with the result that there will be a

concerted effort among the companies here represented to further the study, that in the end a volume of statistics may be accumulated which will be of value to us all.

SUMMARY:

This report is based upon the study of 742 cases with electrocardiograms during 1924-1929 in which definite follow-up data was obtained. Of these, 217 cases were from the *Ætna* files and 525 cases from the files of Dr. Robert S. Starr of Hartford. All the cases were reviewed by Dr. Starr and the electrocardiograms were checked by him.

The volume of cases studied and the period of observation are hardly sufficient to draw any definite conclusions, but we believe they will serve as a foundation for our present underwriting practises and a starting point for further research.

The following conclusions were reached as to the interpretation of electrocardiographic information:

I. CARDIAC ARHYTHMIAS

- a. Premature contractions have no significance as indicating myocardial change and may be disregarded in the rating of a case.
- b. Sinus arrhythmia and sino-auricular block do not indicate myocardial change and may be disregarded. (The question of their significance in cases after the age of 50 years should be further investigated.)
- c. Heart block of any degree or interventricular block is indicative of myocardial change and should call for rejection.
- d. Auricular fibrillation usually indicates serious myocardial change and calls for rejection.

II. Q. R. S. CHANGES

A Q. R. S. interval of .08 sec. is in most cases associated with cardiovascular pathology and such cases should be

carefully studied before accepting the risk. Where the Q. R. S. interval is .08-.1 only those cases where unquestioned history and physical examinations are obtained should be considered, and even then should not be considered as standard risks. A Q. R. S. interval of over .1 sec. should call for rejection.

Slurring of the Q. R. S. group in all three leads should arouse suspicion as to possible trouble and such cases should be reviewed with care. Slurring associated with increased time interval of the Q. R. S. group does not seem to add to the seriousness of the prognosis.

A deep Q3, i.e., 1/4th the widest deviation of the R or S waves in any lead, is indicative of serious pathology and should call for rejection.

III. T CHANGES

The presence of any coronary type of T wave in any lead practically always means serious myocardial pathology and calls for rejection.

T changes in Lead 3 (other than coronary type) are of no significance and can be disregarded. Such changes in Leads I and II usually mean either Digitalization or Myocardial change and should call for rejection.

T slant of itself is of no significance and can be disregarded.

Recommendations as to the type of cases in which electrocardiograms should be called for:

- a. Any case in which cardiac irregularities are found on examination - regardless of amount.
- b. Any case in which the past history shows persistent irregular pulse.
- c. Any case in which there is a history of possible myocardial failure or anginal attack.
- d. All cases applying for \$25,000 insurance or over, particularly in those over 50 years of age who suddenly develop an intense interest in insurance.
- e. All cases 50 years old or over.

DR. UNGERLEIDER—Too much emphasis cannot be placed on the importance of electrocardiography in clinical medicine and, hence, medical underwriting.

East and Bain in their second edition of "Recent Advances in Cardiology" say that in no other medical subject do theory, experiment and pathological findings confirm one another so well.

We have as intimate a knowledge of the working of the heart as of any organ of the body. The information derived from electrocardiography may be limited, but it is reliable, and when we learn more concerning it, the bounds of our limitation will gradually disappear.

Dr. Taylor has noted in his paper that it has been surrounded by a "cloud of mysticism". There is no basis for this. The subject is simple and easily grasped and its value is available to any one who will take the trouble to give it some careful thought.

To be sure, the application of the electrocardiogram to medical underwriting has largely been empirical. We have been content to assess our risks according to the experience and mortality given by cardiologists in their clinics both in this country and abroad.

In the Diagnostic Laboratory of the Equitable Life we have had 944 cases in which electrocardiograms were made. It is well to state here that electrocardiography is just another aid to the physician in making a diagnosis. It should never be used to supplant the regular histories and physical examinations but should be used as a supplement thereto.

Our Diagnostic Laboratory examination consists of a complete history, physical examination, fluoroscope, teleo-roentgenogram, electrocardiogram and oscillometric observation to determine the mean pressure.

As our Diagnostic Laboratory has been in operation only since March 17 of last year, our experience must necessarily be small and no conclusions can be drawn at this time. Nevertheless, a statement of our work will not be amiss.

We made electrocardiograms on 944 applicants. Those made in our study of disability claims are not being discussed here.

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These cases showed a multiplicity of phenomena and in order to study them carefully we have divided them into eighteen main groups and their sub-groupings in the hope that some time in the future we may make a study of their relation to mortality.

Our cases presented the following phenomena (normal cases not included in this list) :

- 49 Sinus arrhythmia
- 8 Sino-auricular block
- 11 Simple bradycardia
- 2 A-V rhythm
- 39 Auricular premature beats
- 7 Nodal premature beats
- 131 Ventricular premature beats
- 4 Unusual premature beats
- 52 Simple tachycardia
- 1 Paroxysmal auricular fibrillation
- 22 Chronic auricular fibrillation
- 14 Partial block, prolonged conduction
- 2 Partial block, dropped beats
- 4 Complete block
- 5 Wide Q.R.S.
- 120 Notched and slurred, except lead III Q.R.S.
- 21 Voltage unusually large Q.R.S.
- 69 Voltage unusually small Q.R.S.
- 26 Unusual peculiarity of Q.R.S.
- 24 Deep Q wave in lead III Q.R.S.
- 26 Splintering of the terminal deflection of Q.R.S.
- 24 Right ventricular preponderance
- 329 Left ventricular preponderance
- 2 Prolonged T wave
- 4 Notched T wave
- 2 Voltage unusually large T wave
- 146 Voltage unusually small T wave
- 2 Unusual peculiarity of T wave
- 9 Unusual voltage of S-T interval
- 9 Diphasic in Lead 1 (T wave)
- 10 Diphasic in Lead 2 (T wave)
- 2 Diphasic in Lead 1-2 (T wave)
- 13 Lead 1
- 11 Lead 2
- 3 Lead 1-2
- 4 Coronary
- 218 Lead 3
- 4 Intraventricular block

} Auriculo Ventricular
Heart block

} T Wave Inversion

These cases were rated as follows and placed in the following categories:

141	were issued standard	
26	were rated in a class providing for 130% mortality	
31	" " " " " "	" 135-140% "
47	" " " " " "	" 145-160% "
62	" " " " " "	" 165-185% "
26	" " " " " "	" 190-220% "
14	" " " " " "	" 225-270% "
454	were declined	
94	were made for change of plan and better offer	
45	" " " restoration of lapsed policies	
4	" " " addition of disability on Retirement	
	Annuities	

From this one will readily see that we have anticipated the mortality that has been Dr. Taylor's and Dr. Starr's experience and have declined those risks. It is evident that we have selected these cases with considerable caution, but these are doubtful cases and over 90% of these cases have impairments either reported to the previous record or found on examination. They were sent to the laboratory for further study of these impairments. In the Metropolitan area of New York City we endeavor to have as many of these cases studied at the Home Office as we can.

It has been our practice to analyze electrocardiograms and to assess the risk on a credit and debit plan, using our Model Book as a basis of comparison. If the electrocardiogram contains elements that are favorable to the applicant, he is given credit for it in the rating and, contrary, unfavorable electrocardiograms call for rejection. We sometimes meet a class of electrocardiograms which we can call indifferent. In these cases the rating as prescribed in the Model Book is applied without modification.

In our rating of premature contractions, we do not feel that they may be entirely disregarded. A statement of the mechanism underlying premature contractions, at this point, would not be amiss.

A premature beat entails a certain amount of wasted effort on the part of the heart for it contracts upon a ventricle which, because of a short preceding diastole is only partly filled with blood. There can be but a small output of blood from the heart at the

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best and often there is none at all, yet the cardiac contraction expends as much energy as when the ventricle is full. When the premature beat occurs infrequently there is not much loss of cardiac power but the more frequently it occurs the more of the heart's energy is wasted. It seems reasonable to suppose that premature contractions occurring persistently and frequently in a chamber of the heart exposed to strain, are indications of trouble in the future.

Multiple extrasystoles from many foci are not usually found in healthy hearts, neither are successive extrasystoles. Extrasystoles are only part of the picture. They suggest the presence of lesions but alone they have no significance, any more than a rapid pulse or a systolic murmur, but an electrocardiogram will tell us the type of a premature beat that is present and whether there is any other pathology present.

It is our belief that sinus arrhythmia and sino-auricular block are of no significant importance and can be eliminated as factors in rating.

Faulkner of Boston has called attention to the significance of sinus arrhythmia in old people. He cited one hundred ward patients taken from the Boston City Hospital, over fifty years of age, who showed sinus rhythm by electrocardiogram. It was found that twenty-three patients, or 85%, of those with sinus arrhythmia showed presumptive evidence of organic heart disease as compared to 57% of the one hundred patients with normal cardiac rhythm.

It would appear further from the study that this type of sinus arrhythmia found in old people is in marked contrast with the youthful type of sinus arrhythmia and is often met with in the presence of advanced and progressive heart disease.

For the time being I believe we are justified in saying that sinus arrhythmia alone and uncomplicated is of no importance to us as underwriters.

It goes without saying that various types of auricular ventricular block and intraventricular blocks are not subjects for insurance.

Q.R.S. CHANGES:

I am impressed by Dr. Taylor's classification of the Q.R.S. changes into three groups; namely, those of .08; those over .08 and under .10 and those over .10.

I am sorry to state that we have made no such classification, being entirely content to accept .10 as the upper limit as normal for the Q.R.S. interval. This standard has the approval of almost all cardiologists at home and abroad. Nevertheless, Dr. Taylor points to a group of individuals whose Q.R.S. occupies less time than the accepted standard and in whom there were sixteen deaths in a group of sixty individuals. Of course, one could argue that fifteen of the sixteen deaths were in Dr. Starr's group, possessed definite evidence of cardiac pathology; such as, angina, coronary occlusion, hypertension, T wave changes and endocarditis, and were certainly uninsurable.

But this is beside the point. Here is a group whose Q.R.S. interval lies between .08 and .10 and in whom cardiac pathology had been consistently found. If this work can be corroborated, I believe Dr. Taylor and Dr. Starr should be congratulated on discovering a worth while fact.

For purposes of study we have divided our Q.R.S. findings into seven classes. We do not know what our mortality is going to be and are really just feeling our way. At present we are suspicious of notching of the Q.R.S. complex but do not pay much attention to slurring unless it is present in all leads, when we consider it ominous.

Of course, a deep Q wave in the third lead is cause for rejection. An analysis of over seven hundred cases by Dr. Pardee and Dr. Willius which could find less than one per cent. who had normal hearts with these findings, is sufficient proof.

T. WAVE CHANGES:

Any change in the T wave, except inversion in the third lead, should be looked upon with gravest suspicion. A low or flat, or diphasic T wave in the first lead is most always an indication of myocardial change. This is important. Do not wait for inver-

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sion to recommend that the applicant is uninsurable on any form or plan. The same can be said in a measure of the second lead and here one must temper his judgment because of the construction of the T wave.

For example, a healthy, large T wave in the first lead and a small T wave in the second lead and an inverted T wave in the third lead is often found in healthy hearts but in this case the large T wave in the first lead gives us the determining factor.

Needless to say, inversion of the first and second leads, either alone or in combination with the third lead, or any combination of the three, is ominous.

Hepburn and Jamison report as follows :

"Negative T waves in lead one. They had forty cases showing negative T waves in lead one of which 26 had arteriosclerosis, or high blood pressure. Forty-five per cent. died after periods varying from one to thirty-nine months. The average length of survival before death was eleven months.

"Negative T waves in Leads I and II were again associated with high blood pressure and arteriosclerosis in 10 out of a group of 20. Fifty-five per cent. were dead after periods varying from one to twenty months, the average being about six months.

"Negative T waves in Leads II and III were found in 24 cases, of whom about half had arteriosclerosis and high blood pressure. Fifty per cent. died after an average survival of nine months, the length of time ranging from one to thirty-seven months.

*"Negative T waves in Leads I, II and III—*Thirteen patients were traced, of whom about half had died after a period averaging six months, the times varying between a month and thirty-three months. The age levels were about the same in those who lived and those who died.

"It will be seen that all these groups had somewhere about a 50 per cent. mortality, death occurring six to twelve months after the discovery of the lesion."

In patients with hypertensive heart disease Willius' experience is as follows:

"Negative T wave in Lead I: In this group he had 463 cases, with 348 deaths of which 260, or 56%, were cardiac deaths and 88 died from other causes. The average survival was 18 months after the examination.

"Negative T waves in Leads I and II: In this group there were 281 cases, with 224 dead within an average of 13 months after examination, 166, or 59%, of these died of cardiac causes and 58 died from other causes.

"T wave changes in Leads I, II and III: In this group 135 cases were reported of which 109 were dead within an average of twelve months after examination; 91, or 67%, of these were of cardiac origin.

"Negative T waves in Leads II and III: In this group he had 140 cases of which 77 were dead within an average of 17 months after examination. Sixty-one, or 44%, were dead of cardiac causes."

These mortalities are the results of repeated studies made over a period of fourteen years. Willius has made similar studies of T wave negativity in other types of cardiopathy and it is a significant fact that throughout all his studies the same high mortality ratios obtain in the various T wave groupings.

From these observations and Dr. Taylor's statistics, it is a good thing to beware of the abnormal T wave.

We feel that a fertile field for the electrocardiogram is in cases of hypertensive heart disease. These are usually applicants whose previous record shows such pressures as 180-110 and then later followed by 136-90, only to be reported by other companies with higher systolic and diastolic pressures, probably after we have accepted them. These variable blood pressures are the bane of all medical underwriters. Our experience has shown that many of them show T wave changes, regardless of the lower blood pressure. A good thing to remember is that a great number of

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these pressures are lower, not because they are in better physical condition, but that their myocardium is poorer.

Vaquez and his associates have been calling attention to the "mean or dynamic pressure". This is not the arithmetical mean. This pressure is easily obtained by the method described by Brathwaite before this body two years ago. It is that point in the taking of a blood pressure by the Pachon oscillometer where the oscillations are the greatest. Vaquez and his colleagues claim that the mean pressure is always stable, that it is uninfluenced by emotional and physiological causes, and that from youth to old age in the normal subject it varies only from ten to fifteen mm. They place the average mean pressure at 90 mm. (top at 110) up to fifty years of age.

After fifty years—90-120 and Vaquez is of the opinion that 120 mm. is pathological (probable range 90 to 110).

We have been attempting, in our small way, to follow this work. It is our belief that cases of true hypertensive heart disease may show presumably normal blood pressure, i.e., systolic and diastolic, but whose mean pressure will be well above those described.

Further study of this group of hypertensives by teleoroentgenogram or orthodiagram, will invariably show a large cardiothoracic ratio and an enlarged left ventricle.

Of this group of 944 applicants who were studied 162 were found to be cases of hypertensive heart disease.

Other fertile fields are those cases where the history or findings reveal arrhythmia, arteriosclerosis, cardiac hypertrophy, or disease of the circulation other than valvular.

Any abnormal action of the heart.

Any doubt as to the quality of the heart sounds by auscultation.

Where the previous record has shown the presence of diastolic murmurs which are being q'd at the present examination, or the previous record or history indicates possible degeneration of the heart.

Especially in cases of those past 45 years of age who give a history of acute indigestion, epigastric pain and gaseous distention followed by vomiting in which it was necessary to administer

morphia or in which the applicant had to remain in bed for some time after the attack. One should be exceedingly careful to always be on the look out for the gastric masquerades of heart conditions.

Finally, large amount cases especially past 45 years of age.

ELECTROCARDIOGRAPHIC CODE AND CLASSIFICATION
IN USE IN THE DIAGNOSTIC LABORATORY OF THE
EQUITABLE LIFE ASSURANCE SOCIETY

1. Normal sinus rhythm
2. a. Sinus arrhythmia
- b. Sino-auricular block
- c. Simple bradycardia
- d. Ventricular escape
- e. A-V rhythm
3. a. Auricular
- b. Nodal
- c. Ventricular
- d. Unusual premature beats
4. Simple tachycardia
5. a. Auricular
- b. Nodal
- c. Ventricular
6. a. Paroxysmal
- b. Chronic
7. a. Paroxysmal
- b. Chronic
8. a. Partial block, prolonged conduction
- b. Partial block, dropped beats
- c. Complete block
- d. This prolonged conduction may be due to digitalis or to disease of the bundle
9. Normal A-V conduction time
10. Rhythm undiagnosed
11. a. Wide
- b. Notched
- c. Voltage unusually large
- d. Voltage unusually small
- e. Unusual peculiarity of
- f. Inversion of
12. a. Wide
- b. Notched & slurred, except Lead III
- c. Voltage unusually large
- d. Voltage unusually small
- e. Unusual peculiarity of
- f. Deep Q wave in Lead III
- g. Splintered Terminal Deflection
13. Right axis deviation of the Q.R.S. group (Right ventricular preponderance)

} Premature beats

} Paroxysmal Tachycardia

} Auricular flutter

} Auricular fibrillation

} Auriculo Ventricular
Heart Block

} P Wave

} Q.R.S. group

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- 14. Left axis deviation of the Q.R.S. group
(Left ventricular preponderance)
- 15.
 - a. Prolonged
 - b. Notched
 - c. Voltage unusually large
 - d. Voltage unusually small
 - e. Unusual peculiarity of
 - f. Unusual voltage of S-T interval
 - g. Shows effect of digitalis
 - h. Diphasic in Lead 1
 - i. Diphasic in Lead 2
 - j. Diphasic in Lead 1-2 } T Wave
- 16.
 - a. Lead 1
 - b. Lead 2
 - c. Lead 1-2
 - d. Coronary
 - e. Lead 3 } T Wave Inversion
- 17. Bundle branch block
- 18. Intraventricular block

DR. OLD—We are greatly indebted to Dr. Taylor, who, in collaboration with Dr. Starr, has prepared this paper.

It is by such careful studies and follow-ups that, in time, we will be able to obtain sufficient data to type the normal, the border-line, and the abnormal electrocardiogram from an insurance standpoint.

I believe, however, until there is more agreement among the cardiac specialists with regard to the interpretation of the tracings, specially from a prognostic standpoint, that the Medical Departments will have to rely on their own interpretation of the submitted tracings.

The clinician, as regards prognosis, rarely looks forward more than five years, and it is at the end of that period that insurance medicine begins.

Further, you well know the wide gap that separates clinical and insurance medicine in evaluating blood pressure observations from a prognostic standpoint, and I might also include heart murmurs.

I was very glad to see that Dr. Taylor emphasized the fact that the electrocardiogram can not take the place of a good personal history and a reliable physical examination; and, that

even after acute attacks of cardiac pathology, we may, in time, obtain a normal tracing.

In other words, an apparently normal tracing should not be allowed to overcome one's clinical sense and knowledge, and in such dubious cases, several tracings should be made over somewhat prolonged periods. Thus, we will not be placed in the uncomfortable position of being asked by the laymen of the production end of the business: "Doctor, if he has a normal electrocardiogram, will you approve the case?" In our experience, an accurate outline of the size of the heart is called for in many cases along with an electrocardiogram.

This report regarding the Q.R.S. changes and the presence of Q waves are particularly significant, and the deep Q3 as being of such great importance is a real contribution.

In addition to the significant points analyzed in this paper, we should also note the character of the P waves, low amplitude of the Q.R.S., high take off of the T wave, and the dime-like contour of the S-T interval, which latter is considered by some cardiologists to be characteristic of a former rheumatic infection.

We also place much emphasis on the family history as regards actual or suspected cardiac deaths having occurred; as we well know the inheritance of poor or brittle vascular tissue, and a vulnerable emotionable nervous system as regards the reaction of the individual to external stimuli and environment. Such a poor family history or a border-line case regarding blood pressure should be given grave consideration with a border-line electrocardiogram.

With regard to the summary, I would agree save with respect to disregarding premature contractions.

Whereas they do indicate active muscle and non-diseased areas, we know they are not normal. They may be compensatory in nature, or due to some intemperance in food or drink or smoking, or fatigue, or the presence of some foci of infection.

We think it wiser to seek the cause, eliminate it, and later on obtain more normal tracings; especially as our medico-actuary statistics show an increased mortality almost in direct

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ratio to the number of extra beats per minute. To the recommendations for the requirement of an electrocardiogram, I would include those applicants who show a constant systolic blood pressure over 140 m.m., and over 90 m.m. for the diastolic at the disappearance of all sound. This is important as it has been stated that four-fifths of circulatory deaths after age 40 are of the arterio-sclerotic type.

I have only the greatest commendation for this most valuable contribution, and it should be of the greatest assistance to each of us who are justly concerned with maintaining a mortality satisfactory to both the Production and Selection Departments with regard to a low net cost for insurance.

DR. STARR—The statistics presented by Dr. Taylor and his conclusions derived from them should be helpful in establishing a tentative bases for electrocardiographic requirements in life insurance examinations. All my patients presented themselves because of real or suspected heart disease, a very different approach from that of the applicant for life insurance. Many of them were seriously incapacitated. On the other hand, among the last two thousand of my cases—this includes those reported by Dr. Taylor—22% were diagnosed as not having heart disease. Such a heterogeneous cardiac group as this is not ideal for the study of electrocardiography as applied to life insurance but at the present time it offers some obvious advantages.

In clinical cardiac examination a reliable history obtained from the patient constitutes the most valuable portion of the record. This is particularly true regarding cardiac diseases of the middle and advanced periods of life. The applicant for life insurance, however, is a proverbially poor historian of symptoms. It may be that he deliberately withholds information, or, as every clinician is aware, he may attribute rapidly increasing fatigability to overwork or advancing age, or dyspnea may develop so insidiously that he unconsciously modifies his activities to it and fails to recognize its presence. A sense of slight but ominous substernal oppression or pain is forgotten until the memory is

jogged by careful questioning. Therefore physical, electrocardiographic and X-ray examinations become of relatively greater importance in your particular field of medicine.

Electrocardiograms are well adapted to statistical study as they are permanent records uninfluenced by personal bias and easily portable. They are subject to technical errors. Although these are usually quite obvious they may make satisfactory interpretation impossible. Dr. Taylor and I found many poor grams in the Aetna series. In my series faulty grams were not used. Distortions of the curves are mostly due to over-shooting of the string. A record of string standardization should be a part of every lead submitted. Induction currents and improper illumination of the field are also occasionally responsible for unsatisfactory tracings.

Electrocardiography is in the stage of development. New signs are being observed and old ones revalued. Interpretation of the grams is still considerably influenced by the personal equation of the examiner. The line separating normal from abnormal findings is not as clear cut or fine as it will be. For instance, Dr. Taylor's statistics suggest that the upper normal time limit for the spread of the QRS complex may be considerably less than the generally accepted 0.1 of a second. Such questions as the following present themselves. What is the significance of notching or slurring of the QRS in any or all leads in the absence of abnormally long duration of the complex? What does unusually large or small QRS amplitude indicate as applied to prognosis or pathology? Is the normal P-R interval ever over 0.2 of a second and does this interval vary with the heart rate? How much must the T-waves be depressed to signify the presence of pathology? Without doubt the study of a very large number of grams, such as insurance material makes possible, will elucidate the answers to these and many other questions to the advantages of both the life insurance companies and electrocardiography.

Many of Dr. Taylor's conclusions are substantiated by the observations of other students of this subject. It is, I believe,

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generally agreed that such electrocardiographic findings as T-wave negativity in the first two leads, prolonged P-R interval, abnormal duration of the QRS complex, etc., constitute in themselves excellent evidence of serious cardiac disease.

In the younger group of cardiacs the disease almost always manifests itself by the usual physical signs of hypertrophy and valvular defects but in coronary disease abnormal physical signs are often inconspicuous or absent and it is among this particular group of undesirable risks that electrocardiography will undoubtedly prove to be of the greatest value.

DR. WHITE—In the first place I wish to thank this assembly for the invitation to listen to these papers this morning and to take part in the discussion. It is probably of greater value for those of us who are practicing internal medicine to learn of the experiences and discoveries of trained life insurance examiners than it is for these examiners to hear of our experience and beliefs. But certainly frequent correlation of our findings is invaluable to us all.

As Dr. Taylor and Dr. Starr have pointed out—and this is the most important part of my discussion—you have before you the rare opportunity to make a vital contribution to our knowledge of the normal electrocardiogram, just as you have had in the past in the case of normal blood pressure. Ten thousand or more carefully controlled electrocardiograms of perfectly normal individuals of all ages, but particularly between 20 and 60 years, collected during the next few years will more than repay the necessary expense and effort because of this essential addition to our present fundamental scientific knowledge. In the course of the acquisition of these data it is likely that we shall widen rather than narrow most of our limits of normal and find, for example, that P-R intervals of 0.2 second, QRS waves 0.1 second wide and notched, and even flat or inverted T waves may be found in persons without heart disease. Time alone will tell, but there are a few things that I wish you would determine.

In the first place is complete inversion of all the complexes in Lead 3 as unimportant as I believe it to be, indicating merely that we are dealing with a horizontally placed heart due to high diaphragm from whatever cause, for the most part obesity? Also may we not have flat or even slightly inverted T waves in Lead 2 in normal individuals with a nervous or a toxic tachycardia, the T wave returning to normal when the pulse slows? This I believe to be so, although it is not yet in the literature.

How much slurring or notching of the QRS wave in any or all leads must there be before it is considered abnormal? Does a QRS wave from 0.08 second to 0.1 second wide mean abnormality? If it does, this is news to clinical medicine and a very important fact to establish. Can the QRS wave in Lead 2 ever be more negative than positive in direction normally? How much so-called right axis deviation may there be normally in a tall lean person with a long chest and vertical heart? In the same way, how much left axis deviation may normally be present in a short fat person? And how often can left axis deviation be abolished by deep inspiration?

What is the normal range of amplitude of the P waves in any or all leads and how often may we normally see flat, diphasic, or inverted P waves in any lead? Can a P-R interval ever be as short as 0.1 second normally or as long as 0.21 second? And finally, does low voltage (5 mm. or under) ever occur normally in all complexes in all leads? I have not found this to be so, contrary to a report by Willius. These are a few of the important electrocardiographic puzzles that you can solve easily in the next ten years.

I would like to conclude this discussion of mine by taking up briefly but in detail the conclusions in the summary of Dr. Taylor's paper.

First come the cardiac arrhythmias. Dr. Taylor has said that

"Premature contractions have no significance as indicating myocardial change and may be disregarded in the rating of a case."

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That is the opinion held by most internists and clinicians who are interested in electrocardiography. There undoubtedly are rare cases, however, in which there occur an excessive number of premature beats, either auricular or ventricular, which are not to be considered as normal. In the case of ventricular premature beats, it is particularly important to note whether the shapes of the ventricular complexes are variable. I feel confident, although I haven't enough figures to prove the point, that if we have two or three different electrocardiographic shapes of the ventricular premature beats, we have far greater likelihood of cardiac disease. If, for example, we have two or three premature beats in a row giving rise to a bigeminal or trigeminal pulse, and especially if these abnormal ventricular complexes are alternately opposite in direction, we are probably dealing with a serious myocardial state; a step further may give us a ventricular paroxysmal tachycardia which is ordinarily one of the most serious findings in medicine. Thus some qualification should be made to this first division under "Cardiac Arrhythmias".

"Sinus arrhythmia and sino-auricular block do not indicate myocardial change and may be disregarded. (The question of their significance in cases after the age of 50 years should be further investigated.)"

One of the factors in the production of sinus arrhythmia and sino-auricular block is the effect of digitalis itself. Of course, if a patient is receiving digitalis, there is presumably heart disease. However, that is not invariably true. I occasionally come across normal patients receiving digitalis for some unimportant symptom or signs, and yet the digitalis has produced an abnormality of the electrocardiogram which has disappeared when digitalis was discontinued. This electrocardiographic abnormality does not mean that the heart is diseased. The administration of digitalis in old people may sometimes be responsible for sinus irregularity.

"Heart block of any degree or intraventricular block is indicative of myocardial change and should call for rejection."

I think that is almost invariably true. There are very rare individuals who have what we call functional bundle branch block with short P-R intervals. These persons are mostly young, healthy, rather athletic adults. There seems to be increased vagal tone in these individuals for we find that the electrocardiogram may be changed by exercise or atropin into a normal record after the discovery of an apparent bundle branch block. Thus, in rare cases, bundle branch block may not indicate serious disease. However, such cases appear to be few in number, and we still must learn something about their incidence and significance.

"Auricular fibrillation usually indicates serious myocardial change and calls for rejection."

That is true, too, with the same qualification as made under the last heading. Once in a great while a young person, as a result of unusual strain, and perhaps the excessive use of tobacco or alcohol, may have a paroxysm of auricular fibrillation instead of simple paroxysmal tachycardia or premature beats. In such individuals, the finding of temporary or permanent auricular fibrillation may not indicate heart disease, but such cases are very rare. Of course, auricular fibrillation, either paroxysmal or constant in type, may be compatible with long life, twenty or thirty years or more, and the chief or main part of the prognosis should depend on other findings than the auricular fibrillation.

There should be here an addition to the section on cardiac arrhythmia consisting of a brief discussion of auricular paroxysmal tachycardia and of auricular flutter. Ventricular paroxysmal tachycardia is almost invariably serious, with rare exceptions. It is not a common type, but it is occasionally picked up by electrocardiogram. A paroxysm of auricular tachycardia is generally unimportant. Most of the individuals we have seen

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clinically with paroxysms of auricular tachycardia are still in good health, mostly years after the first attack. The patient under our longest observation has had a history of attacks for $44\frac{1}{2}$ years, and there are others who have had paroxysms of auricular tachycardia for 30 years or more. No doubt there are a good many in this room who have had short paroxysms of tachycardia dating back quite a few years.

Some fifteen years ago, I took digitalis experimentally, 3 grams in ten days, and for the first and only time in my life I had short paroxysms of auricular tachycardia for a few months, also premature beats and partial block. I have had no such disturbances in the past fifteen years and my electrocardiogram is now normal.

Auricular flutter is more important than auricular fibrillation. It is rarer, and yet I have seen auricular flutter in a perfectly healthy athletic young woman. The auricular flutter occurred twelve years ago; yet today she has no sign of heart disease and recently climbed some mountains in the Adirondacks without any difficulty at all.

We come next to the QRS Changes, which constitute the second main heading. The interesting observation of Dr. Starr and Dr. Taylor that 0.08 second may be the upper limit of normal duration for the QRS wave, is essentially new, and I think, although I have not studied this particular sign carefully, that we are likely to find truth in it. We have until recently felt that 0.1 second was the upper limit of normal, and that a QRS wave 0.1 second wide could be found in a normal electrocardiogram. I shall be surprised, however, if .08 second proves eventually to be above the limit of normal; it may perhaps be at the upper edge of normal but I doubt if it is abnormal.

I should have added that in the study of cases reported by Drs. Taylor and Starr this morning with QRS measurement, the series is much too small to draw definite conclusions. Eleven out of their 13 cases with QRS waves 0.08 second wide showed an abnormal cardiovascular condition, but it is quite

possible that of the next 13 cases they might study, 11 might be perfectly normal and only two diseased.

"Slurring of the QRS group in all three leads should arouse suspicion as to possible trouble and such cases should be reviewed with care. Slurring associated with increased time interval of the QRS group does not seem to add to the seriousness of the prognosis."

I think slurring may add to the seriousness of the prognosis if we have, for example, a QRS wave that ranges between .08 second and .1 second. The abnormal slurring or notching of the QRS wave may eventually help to establish a decision as to whether the electrocardiogram with a QRS wave that wide is normal or not.

And last under Section II—

"A deep Q3, i.e., $\frac{1}{4}$ th the widest deviation of the R or S waves in any lead, is indicative of serious pathology and should call for rejection."

There have been some data published indicating that this is so, but I don't like the term "Deep Q3", because in a great many of these individuals we are not dealing with a Q wave at all. We are dealing with an inverted R wave. The question is a bit complicated and one must take simultaneous electrocardiograms in order to show with certainty whether we are dealing with a Q wave or with an inverted R wave. Take, for example, the individuals who have shown in our series complete inversion of all waves in Lead 3. They have an inverted R wave, which some people might call a Q wave. These people in our series are perfectly healthy. I am confident that an inverted R in Lead 3, which may sometimes be labeled Q, is not necessarily indicative of disease. We need a much more careful analysis of this problem than has been carried out up to the present time.

Finally under "T Changes"—

"The presence of any coronary type of T wave in any lead practically always means serious myocardial pathology and calls for rejection."

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Yes, I think that is almost universally true. Temporarily we may have an illness other than coronary thrombosis, for example, tonsillitis or pneumonia, with abnormality of the T wave. There may be temporary toxic effects which we must study further, but it is necessary for us to be shown whether or not an inverted coronary-shaped T wave can be found in a normal heart.

"T changes in Lead 3 (other than coronary type) are of no significance and can be disregarded. Such changes in Leads I and II usually mean either Digitalization or Myocardial change and should call for rejection."

Yes, with the qualification that sometimes digitalis is given incorrectly by the practising physician and so may alter the T wave without there being any heart disease.

"T slant of itself is of no significance and can be disregarded."

We don't know with certainty about this point.

The "recommendations as to the type of cases in which electrocardiograms should be called for", I agree with completely.

I am very appreciative of the opportunity to join in the discussion of this very important subject.

DR. TAYLOR—If this paper hasn't accomplished anything else, it has called forth considerable worth while discussion, and I feel that I personally have benefited materially from it.

Dr. Ungerleider mentioned the value of a normal electrocardiogram in the underwriting of our cases. I attempted to emphasize in the original paper, and want to repeat, that a normal electrocardiogram, as far as adding anything to the evaluation of a case, is negligible. It means no more, as the doctor suggested to me before the meeting, than the finding of a negative Wasserman in the diagnosis of disease. It means that at the time the electrocardiogram was taken the tracing showed no abnormalities. We do know, however, that seriously damaged hearts may be present and give a normal tracing. I have got

one or two cases that I want to show on the screen a little later.

As to the significance of sinus arrhythmia in older individuals, we have been very hesitant in our work to say that there was none. Our statistics are so meager in this respect in the investigations we carried on that we haven't added anything to it and feel that it should be further investigated. The explanations given in the discussion as to the possible significance of that were most interesting to me.

Apparently I gave the impression in the paper that we were considering hearts that showed premature contractions as normal cases and discounting entirely the presence of premature contractions. The fact remains that we still rate cases that show premature contractions. We do, however, go easy on that rating, and according to our procedure in rating, we will reduce it later if we find the electrocardiogram shows only premature contractions. We are ready, however, to accept cases that show less than 5 per minute of premature contractions as normal cases.

Another point that Dr. White brought out as to the significance of premature contractions which arise from multiple foci. We haven't in this report investigated that point, but I do feel that it is a point very well taken and should be looked into more thoroughly.

A deep Q3.—I personally don't know just what is meant by a curve which is referred to as an inverted R wave. I take it that it is a depressed wave in any lead in which there are no other portions of the complexes present in the way of a Q or an S wave. Am I correct in that, Dr. White? Is that what you referred to?

DR. WHITE—What is meant is timing. For example, if an inverted wave in Lead 3 comes at the same time as the R wave in Lead 2, it must be an R wave. If it is rather widened and comes at exactly the same time in Leads 1 and 2, it must be an R wave not a Q. Simultaneous records must be taken.

DR. TAYLOR—In our work we were particularly careful that we had an R wave and no S wave present.

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The effects of digitalis and the possibility of cases showing changes because of digitalis being incorrectly given, I don't feel should influence us in our handling of the cases as groups. The fact that they have had digitalis in most cases means that it was prescribed for them and I think we can pretty nearly disregard the fact in the handling of the group that some may be mistreated.

I had in mind citing a few definite cases illustrating points in the inversion of the T and Q waves, but time won't permit for that and I only want to briefly cite a few cases that we found in our investigation of our deaths. We had four major cases that had been accepted with electrocardiographic evidence present. The electrocardiogram, however, failed to show that one man would be electrocuted in a bathtub, that another man was going to die from cancer of the kidney and that the third man, who was an athlete in college, decided to catch for his alumni team and died of acute dilatation a few hours following the game, collapsing during the game. The fourth case, which was the only one that we had on our books that died a cardiac death, showed T changes in Leads 1 and 2. He was accepted early in the work on the technician's statement that it was a normal tracing with no one in the department qualified to criticize it, and if that case came up today, he would have been rejected.

I want to again thank the men for having handled me and my paper as graciously as they have and the committee for the privilege of presenting the paper. (Applause.)

EFFECT OF ELECTROCARDIOGRAPHIC AND X-RAY EXAMINATION UPON ORDINARY ISSUE

BY HAYNES HAROLD FELLOWS, M. D.

Assistant Medical Director, Metropolitan Life Insurance Company.

We all know that it is often a most difficult problem to obtain enough medical data to arrive at a fair conclusion in the case of certain applicants for insurance. Medical histories are withheld, sometimes unwittingly and sometimes deliberately. I doubt if the applicant ever draws the attention of the examining physician to any known physical defects, and it is not entirely impossible that occasionally there is an attempt to mask or cover physical impairments. Life insurance is such a necessity today for the well and healthy man and such an excellent speculation for those who know or suspect that there is something wrong physically that the selection of proper insurable risks is becoming increasingly difficult. Necessarily then, we must have an economical, practical, fact-finding method of examination, taking advantage of the useful developments in medicine as they appear.

In the past two decades there has been a tremendous evolution in medicine and this is particularly true in the development of laboratory and instrumental aids to diagnosis. Forty years ago an urinalysis, an occasional hemoglobin estimation, or the examination of the sputum for tuberculosis were about all that were expected of a laboratory. Sphygmographs and X-rays were used but seldom and with little satisfaction. Attention gradually became focused on instrumental examinations and in more recent years one has scarcely been able to keep abreast of the new developments in examination and diagnosis, some of which have proved of great value and some worthless.

The sum total of these new procedures has contributed largely to our medical knowledge and the understanding of pathology in

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the more obscure conditions. But they have likewise brought perplexing problems and complicating factors not only in the practice of clinical medicine, but especially in the field of life insurance medicine. The significance of reports of these "exact methods" of diagnosis and the weight they should carry in a final decision is not the least of these questions.

The physical examination as we have known it unquestionably is indispensable for our purpose. What is needed in addition are certain helpful facts of recognized importance which will supplement this examination—X-rays, electrocardiograms, various examinations made in the physiological laboratory come to mind at once. Many of these procedures are no longer experimental, but have proved their worth and are here to stay. These can be used to advantage.

The manner in which they are used, however, is important. Definite findings of a known pathological condition should be considered as positive evidence whether detected by physical examination or by laboratory examination. Controversial findings or those of a doubtful nature should take a very much less important place in the final decision. While we are adjusting ourselves and finding the proper balance and the correct relationship, we should collect and finally assemble data of various kinds which will give us an experience, just as has been done in the past. New criteria must be established, new statistics made available, new methods and instruments carefully appraised before selected for use. All of this requires patience, judgment, and a healthy, withal a fair, skepticism. If attacked in this manner, much of advantage is bound to accrue.

We are reporting upon a study of 1,000 applicants for insurance upon whom an X-ray or electrocardiogram, or both, was taken at the Home Office between January, 1930, and June, 1931. The object of this study was twofold, first to determine the influence of these special examinations upon the issuance of insurance, and second, upon the subsequent mortality.

In general, applicants who come to the Home Office for examination have an adverse history or previous record, are dissatisfied

with the rating received on a recent application and request a re-examination, or they are invited for a thorough check-up because of vague or serious findings reported in the Field examination. Therefore, the group is not at all representative of the applicant group as a whole. The 1,000 cases here reported are the most impaired of this group which is examined at the Home Office, for in most of them an X-ray or electrocardiogram is taken only when indicated by history, physical or fluoroscopic findings. However, an electrocardiogram is taken routinely on applicants age 35 or over applying for \$50,000 or more and on applicants age 45 or over applying for \$25,000 or more. Of all applicants who are examined at the Home Office, about 16% receive an X-ray or electrocardiographic examination.

To ascertain how these special laboratory reports influenced the underwriting, the following procedure was followed in this study. A tentative or probable decision was made by the Medical Division on each case examined by a Field Doctor if there were enough data for a decision. In many instances an offer or decision had been made to the applicant who was dissatisfied and requested a Home Office review. After the examination at the Home Office, the final offer was compared with the probable offer based on the Field examination. The X-ray and electrocardiographic findings were tallied according to the comparison with the physical findings or history, i.e., whether from an insurance standpoint they were more favorable or negative, the same, or less favorable. In the 1,000 cases studied, 358 had sufficient data before the Home Office examination to indicate what offer the Company probably would have made or actually had made had no other examination taken place. The following table refers to these 358.

TABLE I

Offer which probably would have been
made to applicant if there had been
no examination at the Home Office.

Issue as applied for	29
Issue rated	195
Decline	134
Total	358

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After these 358 applicants had been examined at the Home Office, a better rating was offered in 115 cases (of these, 42 had been or would have been declined on the basis of the Field examination); the decision was unchanged in 184 cases (92 were issued and 92 declined); a higher rating as a result of the Home Office examination was offered in 11 instances; and 48 applicants were declined who would have been issued on the basis of the Field examination. (See Table II.)

TABLE II

Actual offer (based on findings of Home Office and Field examinations) compared with probable offer (based on findings of Field examinations only), divided according to X-ray and Electrocardiographic readings in relation to physical findings or history.

Comparison with probable offer	Total Cases	Comparison of X-ray with history or physical exam.			Comparison of E.K.G. with history or physical exam.		
		More Favorable or Neg.	Same	Less Favorable	More Favorable or Neg.	Same	Less Favorable
Total	358	146(27)	60(16)	30(1)	114(32)	42(10)	10(2)
Better Rating....	115	55(10)	7	3	54(9)	6(1)	.....
Same Issue	92	52(9)	12(2)	2(1)	30(11)	7(1)	1
{ Decline ..	92	27(5)	25(9)	11	21(10)	17(3)	5(1)
Poorer Rating..	11	1(1)	3	2	3(1)	1	2
Decline	48	11(2)	13(5)	12	6(1)	11(5)	2(1)

Note: Figures in parentheses, example 146(27), 146 cases of which 27 received both X-ray and electrocardiographic examinations.

As a result of the thorough examination at the Home Office, the decision was unchanged in 184 cases; it was more favorable to the applicant in 115 cases, and was less favorable to him in 59 cases.

Before the special laboratory tests were made on applicants, it was thought by some that possibly more applicants would be rated or declined and therefore this type of examination would be unpopular with the agency force. We have found, however, that more cases are issued as a result of these examinations. As pointed out above, the changed decisions were in favor of the applicant twice as many times as they were against him. In Table II it will

be noted that of the 11 who received a poorer rating after the Home Office examination, 4 decisions were unfavorably influenced by the X-ray of electrocardiographic readings; and of the 48 who were declined, 14 had unfavorable laboratory findings. Of the 92 on whom the decision was "decline" both before and after the Home Office examination, 16 had an X-ray or electrocardiogram more unfavorable than their physical findings indicated, but 43 had an X-ray and/or electrocardiogram which was negative or more favorable than the physical findings indicated: (27 had favorable X-rays of whom 5 also had an electrocardiogram, and 21 had favorable electrocardiograms of whom 10 also had an X-ray, hence 5 cases had an X-ray and electrocardiogram which was favorable: $27+21-5=43$.)

Of the total 358 cases, 30 X-ray readings and 10 electrocardiographic readings were less favorable than the history or physical examination indicated, just about 10%.

Of the 1,000 cases studied, it was not possible to make any comparison between the probable and actual offer in 642 cases. Of these, 205 were invited to the Home Office for a check upon the Field examination instead of having a second examination by another Field examiner; there were 209 who were applying for the re-instatement of a policy or for a change of the plan or rating on a policy in force; and there were 228 who were applying for new insurance and who came directly to the Home Office for examination. The following table (Table III) gives the Company action compared to the class of insurance applied for and the comparative findings of the X-ray and electrocardiogram.

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TABLE III

Final offer on 1,000 cases compared with class of insurance applied for: divided according to X-ray and Electrocardiographic readings in relation to physical examination or history.

Final Offer Compared with Class Applied for	Total Cases	Comparison of X-ray with history or physical exam.			Comparison of E.K.G. with history or physical exam.		
		More Favorable or Neg.	Same	Less Favorable	More Favorable or Neg.	Same	Less Favorable
Total	1,000	401(82)	153(41)	124(20)	341(110)	89(24)	35(9)
Issued same as							
applied for....	295	181(32)	19(2)	4	121(32)	4(2)	....
Issued—rated....	341	131(26)	48(8)	44(10)	120(37)	29(5)	13(2)
Declined	364	89(24)	86(31)	76(10)	100(41)	56(17)	22(7)

Note: Figures in parentheses, example 401 (82), 401 cases of which 82 received both X-ray and electrocardiographic examinations.

It will be noted that on the 705 rated or declined cases, there were 440 readings of X-ray or electrocardiogram (or 390 applicants, 50 had both X-ray and electrocardiogram favorable) which were more favorable than the physical examination, and only 155 readings more unfavorable (or 146 applicants, 9 had both X-ray and electrocardiogram unfavorable).

It is evident, then, that the addition of the X-ray and electrocardiogram does not cause a disproportionate number of rated or declined cases, but rather is a means of a proper and fairer selection of risks.

This study would seem to dispose of the fear that a careful and thorough examination will necessarily carry a higher percentage of declined or rated cases.

The second point which has to do with mortality will of course take years to complete, but is under way. We are following the cases annually and in time will have the cause of death on many. We may then evaluate the usefulness of these special examinations in determining prognosis, which in our work means the death of the applicant. We have no report to make on this phase of the study at this time.

There is one other study which is being conducted that in time should be of great value. Since, March, 1930, the annual ex-

amination of the 1,300 Home Office employees who have attained the age of 40 has included an electrocardiogram. There is practically no labor turnover in this group, the great majority remaining in service until death or until the retirement age is reached, so that as years pass the data available will be unique and unmatched. As a result of this study we should have a new understanding of the normal changes of the aging myocardium and a new insight into the effect upon life of various deviations from a normal electrocardiogram. We have found in the first year of our study 5.3% of lesions, the significance of which is not open to serious doubt. There are 7 cases (0.6%) of auricular fibrillation and 30 cases (2.4%), of heart block. Independent of these two conditions there are 30 cases (2.4%) of serious myocardial degeneration of which 15 are of the definite coronary disease type.

As we follow the life and medical history of our own employees from year to year, and years of life of the insurance cases upon whom we have tracings, we may be able to learn a little of prognosis and life expectancy in relation to electrocardiographic tracings and X-ray findings.

With this type of work established and operating routinely, the next most important step will be the initiation of a campaign to prevent some cases of cardiac disease and to reduce cardiac mortality.

DR. CRAGIN—Dr. Fellows has given a very valuable and accurate picture of the value of the electrocardiogram. We are in absolute accord with his findings. We have been using the electrocardiogram in various cases since 1925, are fully convinced of its value, and are increasing its use.

We made some general suggestions before the Medico-Actuarial Joint Committee in New York in May of this year and told what we were doing in regard to asking for electrocardiograms. Our practises at present are only changed in that we are more and more calling for electrocardiograms in the large cases. We frequently get definite evidence of uninsurability.

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We have traced 229 cases. Of these 16 were Trial Applications and 213 were applications representing \$5,375,200.00.

37 cases were rejected on electrocardiographic findings alone. Of these five died, representing \$255,000; 28 are living, representing \$325,000.

3 of the Trials are living. One Trial died.

25 cases of arrhythmia that were given standard on the electrocardiogram. Of these 24 are living, representing \$950,000; one died, representing \$100,000.

Under the "A" rating, 8 cases alive, representing \$81,000; no deaths.

Under the "B" rating, 12 are living, representing \$310,000; 2 are dead representing \$405,000. One death, representing \$400,000, was an accidental electrocution.

Under the "C" rating, four cases are living, representing \$95,000, one case died, representing \$2,000.

The analysis of our cases has been rather more from the clinical side and has been presented by Dr. Taylor. We have not as many cases in our series—only about $\frac{1}{2}$ of those represented by Dr. Fellow's series. We shall be interested to compare these with his series carried out by the same tables. Only lack of time has prevented our doing so for this meeting. We can definitely state that we have saved our company many dollars from evidence obtained by the electrocardiogram.

We have also been open to the possibility of erroneous clinical conclusions. Dr. Taylor has told you of one point and we are happy to say that some of the clinicians are beginning to agree with us.

Our work has necessarily been retarded by our geographical limitations. Home Office examinations are few. We hope to shortly remedy this condition.

Our Agency force has been on the whole well pleased with the electrocardiogram for we have been able to give standard insurance in a number of cases previously rated or rejected.

I can only again express, as I have above, that we are in full accord with Dr. Fellows' thought although for general

purposes we must always remember that our electrocardiographic group represents a "suspicious from the start" number of individuals and should be judged accordingly and not as an average of the population.

This also applies to X-ray examinations.

DR. HUSTON—For me to discuss a paper of this type after it has been handled so ably by Dr. Fellows, Dr. White, and Dr. Cragin, is almost a waste of time.

The value of the X-ray and electrocardiograph in determining the insurability of one who has a circulatory impairment, is undisputed. The X-ray has been used for many years to obtain the exact facts regarding the diagnosis of many different life insurance impairments. It has been universally used by all life insurance companies to determine the insurability of applicants who were impaired as a result of anything from a focus of infection to a suspected history of angina, and while we value its use in cardiac cases, I believe as a help in underwriting heart risks the electrocardiogram is of greater value.

We are glad to know that the Metropolitan has started this study. While we have all been using the electrocardiograph, the cases have been so scattered, and the electrocardiograms, X-rays, and interpretations have been made by so many different individuals, that I doubt the ultimate value of a study of our own cases. The Metropolitan's report will be most valuable because their cases are studied and plates and graphs are interpreted by the same men.

Twenty-five years ago it was the general practice to secure blood pressures only upon those individuals applying for rather a large amount of insurance. We have the same practice to-day with regard to the use of the electrocardiograph and X-ray, and we will find their value so great that much more generous use of them will be made.

When we have an individual who shows albumin and casts, we do not take action until we have had a series of specimens for examination. I am convinced that it is wrong to take definite

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action upon an applicant who has a heart impairment, with but one electrocardiogram or one X-ray film, yet we usually have but one. This makes their use more difficult.

As a matter of fact, we have had considerable difficulty in securing the applicant's co-operation in making these special tests. We have required the use of the electrocardiograph on those applicants whose history of physical condition suggests degenerative disease of the heart. This instrument is of little use in cases where the heart is impaired as a result of infection unless the condition has progressed to the point of decompensation. It will not solve the mysteries of a heart murmur, but it is of great value in those cases of myocardial impairment and in the irregularities. When we ask for an electrocardiogram the applicant very frequently refuses to have this special examination, and many cases have been closed out because they were not completed. Many of these cases, we have been informed, have been accepted by some other company whose requirements were not so strict. I believe we should have a code to report those individuals who refuse to allow special examinations.

It is necessary for most of us to depend upon cardiologists and roentgenologists throughout the county to do this work for us. There is a list of specialists in key cities throughout the United States who, I believe, are competent to do this work and to interpret graphs and plates.

We have had some difficulty because our interpretations of electrocardiograms have not always agreed. I have in mind one applicant who applied to us for \$50,000 and was declined because of the finding of the electrocardiograph. This same electrocardiogram was sent to one of the Eastern companies and the applicant was accepted by them for \$75,000 at standard rate. They paid the loss in less than six months when this man died suddenly. Surely a thing of this kind should not occur. The interpretations of a graph should be identical whether made in Des Moines, New York or Hartford.

We had another case recently where the applicant had taken a leave-of-absence of several months, in California, because of a

heart attack. No exact diagnosis had been made. We required an electrocardiogram, which was sent to us by a cardiologist of a good clinic, who reported it normal. We decided the electrocardiogram was not entirely normal and offered a rated policy.

Because of the difference of opinion in interpretation of graphs and X-rays, I feel it is wise for all insurance companies to concentrate on the use of certain cardiologists and roentgenologists. While these men probably do not have an insurance point of view at the present time, if we send them this work, through their constant contact with underwriters they will soon have our viewpoint. The value of their work to us will be multiplied many times when they learn something about the principles of underwriting.

We are dealing to-day with an insurance-wise public, and those who know themselves to be impaired are not going to have these special tests unless they are forced to do so. If our requirements appear rigid the applicant seeks to obtain insurance in another company. Without full information, that company will probably feel that the impairment is of little importance, or perhaps their examiner will not find it. I have always felt that we should be protected against such individuals.

It has been a pleasure to discuss Dr. Fellows' paper, and I appreciate the wonderful work which he has started.

DR. WHITE—Mr. Chairman and Gentlemen: I have been much interested to learn of Dr. Fellow's worth while results of electrocardiographic and X-ray examinations of doubtful risks in the Home Office. That is, the findings by electrocardiogram and X-ray were favorable twice as often as they were unfavorable, demonstrating at once the value of such methods of study in the uncertain insurance cases. Such favorable results depend, I judge, primarily on two things; first, the discovery by electrocardiogram that an arrhythmia consists only of extrasystoles or premature beats or of a sinus arrhythmia, and second, the proof by X-ray examination that the heart is normal in size

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when some enlargement had been suspected by other methods of study. In a positive way, too, electrocardiography and X-ray examination have proved helpful in Dr. Fellow's analysis, as we should expect, mainly, in all probability, through the discovery of an unsuspected cardiac or aortic enlargement by X-ray or by finding intraventricular (that is, bundle branch) block, long P-R intervals, or coronary T waves by electrocardiogram.

As a clinician, however, I must utter a word of warning to you, even though you are doubtless perfectly aware of what I am about to say. Almost one quarter of all my private patients with angina pectoris (and they are very numerous in these days of stress and strain) seem perfectly normal not only on physical examination but also by X-ray and electrocardiogram. The history establishes the diagnosis in these cases, *which are not to be labeled pseudo-angina pectoris*. It is essential that in some way in your examination the history be included to rule out this very important cardiovascular condition.

Once more, and finally, I wish to emphasize the great opportunity you have to make a vital contribution to human physiology and medicine as a whole in gathering together carefully taken electrocardiograms of thousands of normal individuals. You will then establish probably for all time the limits of the normal human electrocardiogram, a feat that has not been yet accomplished.

DR. FELLOWS—May I first thank those who have been kind enough to discuss this paper.

There are a few points that I have reserved for discussion which might very well have been in the body of the paper. It is perfectly true that an electrocardiogram properly taken, technically perfect, is a recording of the cardiac phase at the time. It is true also, that two or more people looking at the same set of facts may arrive at different conclusions. And yesterday when Dr. Cook disagreed slightly with Mr. Milligan and gave as his opinion that the electrocardiographic findings in the series of jumbo risks that Mr. Milligan talked about probably

would not have shown definite evidence of cardiac damage, Dr. Cook had not had an opportunity to review those records. It so happens that in going back over those cases of death after the claims had been paid, we were able to get in touch with some of the physicians. After telling them that the insurance had been paid and the case closed, we then asked: "What about this man when he was living? What did you know about him?" In more than one instance the reply was, "We knew he had heart disease". "How did you know it?" and the answer was, "Well, among other things, he had dilatation, hypertrophy", or "We have a series of electrocardiograms dating from his last coronary attack and we knew that he had been sick". This information was given to Mr. Milligan and he incorporated it in his paper; moreover, there were some cases with definite evidence of heart disease in existence before the insurance was issued. Unfortunately, at the time of issue we did not have all of that information.

A moment ago I mentioned the difference of interpretation from the same facts. This week we had a case of re-insurance at the Home Office. Among the data was an electrocardiogram. I showed the tracing and the papers to two of our doctors who are familiar with that type of work. One of them diagnosed "definite coronary disease" on the basis of the electrocardiogram. The other physician had the same papers, the same tracing and noted the same abnormalities, but didn't feel that in the light of our present knowledge he should make a definite diagnosis of coronary disease and instead made a note of "no definite evidence of cardiac disease". The following letter to the applicant, written by a very eminent physician whose name is known to all of us, had not been shown to the two doctors. "Dear Frank, I understand that you are applying for life insurance and that you want a letter from me as your personal physician. I think it is fair to say that your physical examination is perfectly normal, that your X-ray is entirely negative, that your electrocardiogram is normal and that you have entirely recovered from the coronary occlusion of 1926." (Laughter.)

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Now, the point is that these two men, equally trained, looked at the same tracing and saw the same things. One concluded that there was evidence of coronary disease; the other recognized the abnormalities, but felt that he was not in position to be quite that definite and said he would have to make a diagnosis of "no definite disease". The facts were there. It is in the study of our normal Home Office employees that we may hope to find the answer to many of these puzzles.

One type of case described by Dr. White will be difficult to eliminate. We will not catch all the cases who have or shortly will have angina pectoris or coronary thrombosis. However, those that we do detect will be a saving for our companies. A word of warning: the executives or medical underwriters who are not actually dealing with patients and tracings and interpretations may expect too much from this method of examination. Institute a follow-up procedure on insurance cases issued or rejected which will enable you to make a fair analysis of our newer methods of examination sometime in the future.

Dr. Huston brought up the question about action on one examination. If it is negative, I should think that it might be a very proper procedure to repeat the examination, but doesn't this apply to all forms of examination, including physical, history, etc.? If it is frankly positive, I don't think it is necessary to repeat.

The fact that the smaller companies do not have available men or equipment is a very important consideration. Perhaps this organization will at some time have to meet that problem and it may be that a central bureau, properly equipped with man power and brain power, interpreting laboratory data for all of us will give us enough better results to warrant having such a group rather than having in each Home Office one or two or three people trained in this work.

I wish again to thank this organization for the opportunity of giving these few results, and one thing further I would like to say. We have analyzed the electrocardiographic examinations of our Home Office employees on the basis of electrocardio-

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graphic findings. If anyone here wishes to have a copy of that analysis of normal working people and will just write to me at our Home Office, I will be very glad to forward a photostatic copy. It may be of some value to you; it has been to us. (Applause.)

THE ARTERIO-SCLEROTIC HEART

BY C. C. BIRCHARD, M. D., M. R. C. P. (LONDON),
F. R. C. P. (CANADA).

Chief Medical Officer, Sun Life Assurance Co. of Canada.

A rational classification of diseases of any organ or system should be based upon aetiology or morbid anatomy, but with the heart, as with the kidney, we have not been too successful. Accordingly the condition, known clinically as the arterio-sclerotic heart, is a compromise between our diagnostic short comings and our desire to correlate clinical manifestations with anatomical findings. It will of course be understood that the cardiac conditions thus classified are in many cases only partially "arterio-sclerotic" in aetiology; the class is so named merely because arterio-sclerosis can be relied upon to be present to greater or less extent. The degenerating myocardium of the second half of life does not owe all of its lesions to arterio-sclerosis even where other specific causative factors such as thyrotoxicosis, rheumatism, acute infections and syphilis are lacking. It has a pathology peculiar to itself, but, in the present state of clinical medicine, little or nothing is known of primary intrinsic myocardial disease, and *clinically* we have to assume, perforce, that they are all secondary to extra myocardial conditions. (For the moment, looking upon the coronaries and their branches as extra myocardial.) Arterio-sclerosis being present always and being definitely a very great, and probably the greatest, hindrance to the maintenance of a good myocardium, it is expedient to style these cases as "arterio-sclerotic".

Also it is to be understood that we are dealing with the life insurance aspects of arterio-sclerotic heart disease. The well developed arterio-sclerotic heart should not come within the pale of life insurance if we can prevent it: at least not till we know more about the condition than we do at present. But in its early stages, it does come within the purview of insurance, and it is

towards ways and means of protecting our masters, the insurance companies, against foreseeable early deaths from this condition that these remarks will be directed.

That arterio-sclerotic heart disease is of much importance in insurance is indisputable. Studied by lives, it is the greatest single mortality producer in the list. But studied by amounts, its importance is still greater, since it affects mainly those in the latter half of life, those who carry the largest policies.

Aside from the preceding, another reason, which makes its detection by objective observations important, is that the condition casts its shadow a long way ahead of its prospective victim and in a manner to be visible to him, and usually to him only; the substernal discomfort, the undue breathlessness on exertion, and the unwonted fatigue after a short office day and eighteen holes of golf—these are all factors which the subject notices. Very frequently he is a man of large affairs in the business world and an acute observer of everything including his own body. He appreciates more or less subconsciously, and often consciously too, that the physical organism is failing and he becomes an easy subject for the life insurance salesman, and the amounts involved may be very large indeed. And at such times with the aid of coexisting cerebral arterio-sclerosis, what very ridiculous values to their corporations and their families these men can place upon themselves!

For the detection of these cases we have two aids: *Firstly*, a perfectly honest history, and *Secondly*, a good clinical examination by an expert physician. The first aid is often lacking—a copious immigration of Mediterrean peoples and the intense materialism of the times have combined on this continent to reduce average honesty to a degree that the first aid is evidenced too frequently by its absence. The second aid, a careful examination by a reasonably expert physician must be our principal protection. The proposer's reputation for health as disclosed by the inspection report is of little use, for the reason, as I said before, that the early signs of sclerotic heart disease are anything but conspicuous, and usually not apparent to others unless by accident or

talkativeness on the part of the subject. How then, may the examination be made to weed out these foreseeable deaths?

Let us review the principal means of investigating arterio-sclerotic heart disease. In the relative order of their importance to us as life insurance medical advisors, who must appraise lives through the eyes of others,—not to the clinician, who gets a frank and copious history, and who evaluates the gravity of disorders usually more or less well developed, with the patient under his own eye.....*First*, the electrocardiogram; *Second*, the size of the heart and great vessels; *Third*, the blood pressure and *Fourth*, auscultatory phenomena.

The Electrocardiogram: The method of investigation of the heart through its electrical activities was made clinically possible by Einthoven's invention early in the century of a very sensitive practically lagless, dead-beat "string" voltmeter. The instrument is usually called a galvanometer, an erroneous name, since as physicians use it, it measures voltages, not currents. The merits of the apparatus lie in its small lag and dead-beat properties, prime necessities in recording phenomena of brief duration; the sensitivity factor presents no difficulties. Subsequently its clinical use was put on a practical basis for the analysis of the events of the cardiac cycle, by Thomas Lewis of London, and it is now our best means of studying all stages of degenerative heart disease.

As is well known to you, the electrocardiogram is conventionally obtained in the form of three separate records by successively connecting the two arms and left leg in pairs (Right arm—left arm or Lead I, right arm—left leg or Lead II, and left arm—left leg or Lead III) with the instrument, which graphically records voltages as ordinates and time as abscissae. Ordinarily each cardiac cycle produces five deflections, rather unfortunately named P. Q. R. S. and T, the first being the result of auricular activity, and the remainder of ventricular origin, with rarely a sixth, the U wave.

In youthful health there is a remarkable constancy and uniformity in the configuration of the deflections as between different patients, and from year to year in the same patient. In other words, provided the heart is normally placed, and every fibre is

functioning properly and precisely under the co-ordinating influence of the intrinsic cardiac nervous mechanism (the sino-auricular and auriculo-ventricular nodes, the Bundle of His, with its terminal Purkinje fibres), the electrocardiogram will closely approximate to the form which we recognize as normal. But as soon as disturbance of the relative weights of the ventricles appears, or there is disturbance in the co-ordinated activities of the fibres, abnormalities in the electrical records result.

While it is not within the province of a paper such as this to go into individual abnormalities of electrocardiograms, the following generalisations may perhaps be useful.

1. The P wave is of auricular origin and disturbances thereof can advise us of perversions of auricular function, such as flutter, fibrillation, extra systole, and frequently auricular over-distension from mitral stenosis.
2. The Q. R. S. group of deflections, the initial deflections of the ventricular electrocardiogram, are due to electrical 'explosion' occurring in the muscle fibres as a result of the arrival of the contraction stimulus, and the total duration of Q. R. and S. measures the time required for the stimulus to pass over the whole ventricle. The opening of the aortic and pulmonic valves follows the beginning of the group by a small fraction of a second. Disturbances in contour or increased duration have mainly to do with partial or complete failures in conduction of stimuli by one or other of the two main branches of the Bundle of His or their terminal arborizations, the so-called Purkinje system. This applies whether the disturbances are caused by focal or diffuse lesions, and whether due to vessel occlusions and infarctions, or trophic disturbances, respectively. In addition the general configuration of the waves is dependent on the relative weights of the two ventricles, but this abnormality does not increase durations.
3. The T deflection is in some peculiar and debatable manner associated with the passing of the ventricular myocardium

out of systole and the termination of the deflection coincides with the closure of the aortic and pulmonic valves. Aberrations of the T wave have mainly to do with the actual condition of the muscle of the ventricles—focal lesions, trophic disturbances and fatigue. Since its character depends on the orderly completion of ventricular systole, and since orderly completion of systole depends on its orderly initiation, it is, of course, affected by anything which affects the propagation of stimuli through the ventricles.—Hence, abnormalities in duration and configuration of the Q. R. S. group are very often associated with abnormalities of 'T'.

4. Each and every deflection is due to differences of electrical potential or voltage built up between the limbs to which our voltmeter (or galvanometer, as you wish) is attached by the electrical currents flowing in many and diverse directions through the heart. If these currents should flow in perfectly haphazard and random fashion, by mutual cancellation the resultant would be zero, which is far from the case. Actually, each ventricle produces currents (and therefore electrical potentials) of very considerable magnitude, but it so happens that the currents from the right ventricle are very largely cancelled by currents of opposite directions from the left ventricle. But this mutual cancellation of currents does not apply to the apices of the ventricles, and it follows that the ventricular electrocardiogram (Q. R. S. and T.) is for the most part the electrocardiogram of the apex region.

It is of interest to notice here that the magnitudes of the deflections (in the three leads) which represent any given electrical event of the cardiac cycle bear a very definite relationship to one another, which is that:—*the algebraic sum of the magnitudes of the deflections in Lead I and III is equal to magnitude in Lead II.* This allows us to deduce either by graphic means or by calculation, or roughly without any aids other than one's head, the direction ('electrical axis' so called) and magnitude of the current producing the

deflections. It is an extremely simple procedure, with which you should familiarize yourselves since its use brings a very considerable amount of order into the interpretation of electrocardiograms. It can be found in any text book usually under the heading "Einthoven's triangle".

The purpose of the above synoptic summary, which you have recognized as accurate in principle rather than in detail, is to stress the fact that the character of the electrocardiogram is a reflex of the degree of orderly co-ordination amongst the fibres of the myocardium in performing a cardiac cycle. Since disturbances of the co-ordinated activities of the various parts of the myocardium are of very frequent occurrence in arterio-sclerotic heart disease, it is in this condition that the electrocardiogram has its greatest value.

As electrocardiograms are received in your offices with interpretations appended, there are a few points about which one should be on one's guard:

The first point, a matter of technique, is the fidelity of the graph in portraying the changes of electrical potential. With the 'string' type of instrument, fidelity is prone to be defective from a too slowly moving recording element, the 'string' so called, which is particularly likely to alter the magnitudes and conformation, and increase the duration of the initial ventricular deflections (Q, R, S.) which are most important. But if the operator of the instrument will record in each Lead of the electrocardiogram, the results of cutting into the circuit one or two millivolts, inaccuracy of calibration for voltage and undue slowness of the recording element will be obvious at once, though an experienced eye can usually 'spot' a sluggish string from the look of the graphs. Slowness is indirectly due to extraordinarily high resistance developed in the commonly used plate electrodes applied to the patient's limbs with the aid of flannel wet with saline. High resistance decreases sensitivity, which is overcome by slackening the 'string' and it is slackness which is responsible for slowness. The high resistance is apparently associated with the development of oxide

films on the metals. These have peculiar electrical properties which make the 'strings' deflect slowly and otherwise perform in anomalous ways which need not be gone into here. It is much safer for operators of 'string' type instruments to use the immersion electrodes of Einthoven and Lewis. With these electrodes, practically all the difficulties of unduly high resistance and slow 'string' will disappear. There is no necessity that the immersion electrodes should be of non-polarizable type, as postulated by Lewis, provided they are of reasonably large dimensions. With an instrument of the oscillograph type, a more recent development, which consists essentially of a valve tube amplifier and a rugged galvanometer of short period, the ohmic resistance of the instrument is so very much higher than that of the patient and the electrodes combined, no matter what the condition of the electrodes, that high resistance in the electrodes is of small consequence. But having no personal experience of those instruments I am unable to say whether the other phenomena than resistance exhibited by oxide films on the electrodes affects the behavior of the recording element.

The second point, a matter of interpretation, is that cardiologists vary considerably in their conceptions of normality. This is particularly so in their opinions of 'left axis deviation' (counter clockwise rotation or deviation within the chest of the average direction of the currents producing the Q, R, and S. deflections), the electrocardiographic sign of relative enlargement of the left ventricle. Some observers appear to pay little attention to the occurrence of this phenomenon, regarding it as of little or no consequence. I am inclined to disagree with this view, being of opinion that 'left axis deviation' in the thirties is, *per se*, of very serious import, less so in the forties and fifties, and a matter of indifference not until the sixties. The normal process of aging in the heart appears to consist essentially of a thinning out of the capillary net-work of the right ventricle with a consequent relative increase in the weight of the left ventricle, a matter of nutrition. If the phenomenon of 'left axis deviation' is associated with this change in capillary blood supply, as I believe it is, it follows

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that the early appearance of 'left axis deviation' is indicative of premature senility in the heart.

On other features of the electrocardiogram there is more or less unanimity of opinion as to clinical significance, but the members of this association have before them good opportunities for profitable research in evaluating the various electrocardiographic abnormalities in terms of mortality.

Generally in the interpretation of your electrocardiogram you will get no uniformity of results unless you acquire the necessary skill to do your own reading. This, I may say, is really not at all difficult.

SIZE OF THE HEART

The size of the heart is, in the opinion of many, one of the best of criteria on which to base opinions as to its anatomical and functional integrity. The statistical findings from time to time presented to this association have pointed to its importance, and opinions of clinicians are for the most part in agreement. *While the normal sized heart may be the seat of serious disease, it is not likely to be; but every enlarged heart is a diseased heart.* Here one might mention, that in the past there has been a tendency to look upon hypertrophy as essentially an end result of overwork to which view I find myself unable to subscribe. There is much evidence that it is primarily a pathological entity, which of course may be augmented in degree, by conditions which overwork the myocardium. All of us have seen too many cases of hypertrophy, where valvular lesions or high blood pressure were lacking, for it to be other than a primary pathological condition.

Hitherto we have asked our examiners to percuss the heart for the position of the left border, and the width of the upper sub-sternal dullness: some too have expected that almost impossible observation, the percussion position of the right border. While the method of percussion is relatively crude in the hands of the careful expert, it is doubly so in the hands of the very busy practitioner. Add to this the variability of the two reference planes commonly used, the anteroposterior vertical sections through the nipple and that through the mid-clavicular point, and the sum

total of variability becomes so great that the result of the observation as modified by the peculiarities of life insurance practice is scarcely quantitative. When the subject is fat and deep chested or emphysematous the procedure may be quite useless. One must keep in mind that heart volume varies as the cube of the diameter: an error of two centimetres in percussing the left border of the average heart means an error of sixty-five per cent. in volume. Yet so great is the value of heart volume from a prognostic standpoint, that this very crude measurement has been able to divide hearts into three groups of 'normal size', 'moderate enlargement', and 'much enlargement', with extraordinarily different mortality rates. But had the appraisals of heart size been accurately made, homogeneous groups had resulted, and the 'normals' would have had much lower mortalities and the 'enlargement' groups much higher. By the size one appraises the ability of the heart to withstand any continued strain. By way of illustration, consider the heart of the pregnant woman where one of the prime desiderata in gauging the hazards of the latter months of the pregnant state and of parturition, is the size of the organ.

Here it should be mentioned that there are widely varying opinions as to how much the hearts of persons of the same age, sex, race and build may vary and still be regarded as normal. Some clinicians hold that the normal variation of silhouette area may be as much as plus or minus 27.5% from the mean, or in other words, that the maximum normal area may be seventy-five per cent. greater than the minimum normal. Personally, I hold with those who are of opinion that the normal limits of variability in size are narrow. I am quite convinced that eventually mortality studies will be presented to this association which will prove this as clearly as they have proven that departures from optimum blood pressures or optimum weights are serious matters. And the court of last resort in such matters must be the mortalities obtaining in groups of patients with hearts of different sizes in relation to other physical dimensions.

For us there is one way and one way only by which we may arrive at an accurate opinion as to the normal or abnormal volume

of the organ, and that is by radiographic examinations under standard conditions. At the present time it is possible to get radiographic plates of chests practically everywhere, even in the small towns, but the experience of most of you has been, I believe, very similar to our own, which is that most of the plates submitted come without any data as to the circumstances of the exposure, and many are of such poor quality that they are not of as much use as they might be. Also, we receive reports from radiologists without the films being submitted, which are apt to be misleading and dangerous unless you know your radiologist. It is not uncommonly the practice for him to give his opinion without actually making measurements—mere impressions, which vary from day to day, and, except where the departure from normal is great, may not be substantiated by succeeding observers. The most eminent radiologists are guilty of this. Last winter a very widely known European radiologist of large experience visited Canada and America. To a question as to what he regarded as the normally sized heart, his reply was that he came to an opinion from the general appearance of the person—build, muscular development, etc. In other words, he has no scientific method—he relies upon art. In clinical medical practice, that may be good enough for the present day, but it will not be for long. The art of medicine is rapidly emerging into the science of medicine, and nothing is scientific until it becomes quantitative. In clinical practice the worker is not often subject to intelligent criticism and his work does not need to be correlated with the work of others, which allows the 'impressions' of radiologists to pass as good observational coin, so to speak. But in our work, so far as possible, we must have measurements, and measurements made under standard conditions.

At the present time and in the present condition of the X-ray art, we cannot expect, as a matter of routine, much more than a good clear antero-posterior plate made with the film at least six feet from the target of the X-ray tube, and preferably eight or nine feet, and sufficiently exposed to give a clear shadow of the great vessels and heart. Such plate will disclose gross lesions of

lung as well as the cardiovascular apparatus, and will lend itself to such measurements as the cardiothoracic ration whose high limit for normality is usually taken at between 0.50 and 0.55. One well-known cardiologist allows 0.57. If more ambitious, one may employ the formula of Hodges and Eyster for evaluating the area of the heart's silhouette, but with our present knowledge the cardiothoracic ratio as an index of the heart volume is probably the practical limit of refinement. That coupled with definite knowledge concerning the width of the aorta and reasonable certainty that no other gross chest lesion, cardiac or pulmonary, is present, gives a feeling of security when dealing with applications for large amounts, which is well worth the cost.

While I have mentioned that routine requirements will be subserved by a flat antero-posterior six or eight foot plate, those skillful radiologists who appreciate that life insurance practice is mainly interested in uncovering incipient disease (clinical medicine has hitherto concentrated on more or less well developed disease) can assist us much indeed by fluoroscopic studies and oblique plates. The left anterior oblique (the line from left mammary region to right scapular) undoubtedly gives a good exposition of the aortic arch, pulmonary artery and heart chambers, but one doubts whether it can be made to lend itself to anthropometric analysis, particularly when the data must be obtained through many X-ray laboratories of varying degrees of merit, both in mechanical equipment and personal.

Of course, the X-ray examination suffers from other defects than those of the radiologist. These are, I believe, that much of the apparatus presently in use is of insufficient power, which necessitates too long exposures with rays which are too penetrating—too 'hard' as the radiologists say—to give good 'soft tissue' detail. In addition to rapidly and continuously changing in volume, the heart moves rotationally about two axes, one approximately the longitudinal axis of the heart, and the other an antero-posterior one at or above the attachment of the great vessels. Yet the exposures are frequently longer than the whole duration of a cardiac cycle. Naturally fine definition is lacking. The imperfect out-

line of the heart is that of diastole, plus a bit more due to rotational movements, and the atheromatous plaques of the aorta and calcification of the aortic and mitral valves are seen so seldom that the radiologist becomes ecstatic when he discovers them.

Elementary considerations determine that for ideal results the exposures should not exceed one fortieth of a second, and fortunately such exposures are becoming practicable with the new 1,000 milliamper transformers and precise timers being brought out by American manufacturers of X-ray equipment and the X-ray tubes of at least one European manufacturer. In addition there will have to be produced a device for synchronizing the exposure with a pre-determined instant in the cardiac cycle. This too is extremely easy of accomplishment thanks to the versatility of the photo-electric cell of the talking moving picture and the valve tube amplifier of your radio outfit. With exposures of $1/120$, $1/60$, $1/40$ second (the almost universal 60-cycle alternating current of commerce determines the possible choices) at pre-determined instants in the cardiac cycle, and with sufficient ray of 'soft' character, there is every reason to expect precise outlines from the heart and accurate delineation of the aorta, calcification of valves, and perhaps even atheromatous deposits in the coronaries. Also it would not appear improbable that given a sufficient quantity of 'soft' ray and a special contrast plate, we may shortly be able to outline the lower margin of the heart where it overlies the liver, which has hitherto been impossible. If so, it will be within our grasp to produce with comparative ease much more accurate formulae for evaluating departures from normal in heart volume, than any which have hitherto been produced.

In this matter of heart size and its normal variations there is awaiting action by this association a very wonderful opportunity to serve scientific medicine: Firstly, by laying down definite rules for radiographic examinations of hearts, and educating the profession in their application. You have been largely responsible for accurate sphygmomanometry being widely obtainable; with less effort, roentgenologists can be educated to make satisfactory plates of the heart and great vessels. Secondly, by statistically

investigating the various measurement precedures and correlating the results with other anthropometric constants, such as body surface, weight, height, age, sex, race, etc. and eventually the mortalities obtaining in various groups. Thirdly, by collaborating with the instrument makers towards the production of apparatus which will give the best possible results.

Of the blood pressures obtaining in arterio-sclerotic heart disease, I have no definite opinions other than that, in the present state of knowledge, our opinions on its prognostic value in, and its aetiological relationship to coronary and aortic sclerosis are very hazy and unsatisfactory. I cannot offer any suggestions as to how you are to evaluate disturbances of blood pressures when associated with definite signs of disease of the coronaries and aorta. But one does feel that the blood pressure groups of contributors to this association in previous years were by no means homogeneous, and that more thorough clinical investigation to weed out as many as possible of the coronary cases had given purer groups and lower mortalities. In other words, elevation of blood pressure *per se*, so-called 'essential hypertension', is probably less serious than life insurance data makes it appear.

Concerning the apical systolic bruit, that piece de resistance of the actuaries, and of the physicians of yesterday, I do not wish to minimize its importance. In the absence of endocarditis, it is undoubtedly an index of impaired myocardial tone, which in those of appropriate age is apt to be a sequence of arterio-sclerotic changes. But I am of opinion that life insurance data over-estimates its importance for the reason that all groups hitherto investigated must have been very far from being as homogeneous as they might be made today with more complete investigation.

In the type of cardiovascular examination hitherto demanded where policies of large face values were involved, and in the amounts we have paid for them, one might respectfully suggest that we have been a bit ridiculous. All of us have known for a long time that a large proportion of those with arterio-sclerotic hearts could slip past our barriers, yet we have given our approvals to applications for hundreds of thousands on the exami-

nations of a couple of men not too well known to us, working for fees ridiculously small in proportion to their responsibilities and with facilities quite inadequate to meet one of the most difficult tasks in clinical diagnosis. Small wonder is it that the companies issue large policies today and the policy-holders die of coronary occlusion tomorrow.

The primary purpose of this paper is to plead for a reasonably thorough investigation of the hearts of applicants who have passed the meridian of life, when the amounts involved are large. In no other way can the issue of large policies on such lives be made safe. Of course, X-ray examinations, electrocardiographic examinations, and thorough clinical examinations will not exclude all the early deaths from sclerotic disease of coronaries and aorta, but such examinations should, I believe, eliminate three quarters of them, which will amply justify the cost.

DR. LIVINGSTON—Dr. Birchard in his excellent paper has presented good reasons for special investigation of hearts when applicants have passed middle life and the amounts are large. I believe we might seriously consider requiring such special heart investigation in many cases when the amount is not large but we have, or should have, some suspicion that we may be dealing with an impaired heart or cardiovascular system.

A perfectly honest history is undoubtedly the first aid in the detection of the arterio-sclerotic heart. I agree with the criticism that such information is usually absent; but do we always follow up and investigate the leads we obtain? The *first* question on our medical examination blank regarding past illness is, "When and for what did you last consult a physician?—Name and address of such physician". I am convinced that we obtain more important information from this question in its position than from all the rest of the questions. Incidentally, I believe this question has a psychological effect which results in more accurate answers to the rest of the questions. This same question in another position did not give us such useful information as we now obtain. Not uncommonly a recent illness is "ex-

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plained away" but on investigation sufficient information is unearthed to call for special examination. Indigestion caused supposedly by eating too rapidly or too large a meal; an attack of pain in the lower sternum or epigastrium with no definite diagnosis; asthma, and especially the nocturnal form, appearing in middle life; an attack of giddiness, syncope or spurious fainting spell; a sudden decision to curtail normal exercise; such a history should at least make us go slowly and investigate carefully.

Regarding the electrocardiograms, I agree that we must learn to interpret them ourselves. We certainly cannot accept the opinion so often expressed "within normal limits". Pardee has recently described a large Q wave in lead 3 not associated with right axis deviation, which he considers to be an indication of narrowing of a coronary branch or branches. In 43 cases studied this abnormality was not attended by significant changes in the T wave but 63% had anginal syndrome. Willius, of the Mayo Clinic, in a study of 300 cases with this sign found it the only significant electrocardiographic feature in 66% of the cases and 89.3% showed hypertensive heart disease or coronary disease. In the Underwriting Manual of the Canadian Life Companies we have split up the irregular and intermittent pulse groups and we are prepared to give a better decision when a normal electrocardiogram and orthodiagram are presented. Our agency force find this underwriting practice a useful lever in persuading applicants to have these special examinations. We have found that our field force have less difficulty in securing the applicant's co-operation when they stress the value to the applicant of any special examination from a health standpoint, leaving in the background for the time being the question of life insurance. You will note that Dr. Birchard definitely expresses his opinion of the significance of left axis deviation in the thirties, forties and fifties. It would be helpful to have the reasons for this opinion as a similar view is not usually taken by cardiologists. Should we not consider adding a code to the record for requested and abnormal electrocardiogram,

just as we have for blood sugar estimations? Incidentally, we frequently request special X-ray of chest or other examination, and such information if submitted through the record should be helpful to other companies, especially when applicants are "shopping".

I agree with the opinion that while the normal-sized heart may be the seat of serious disease it is not likely to be, but every enlarged heart is a diseased heart. The experience of Life Insurance Companies certainly shows the importance of enlargement of the heart. We ask our examiners, "Do you find on careful examination any evidence of past or present disease of the heart?" It is only on finding some abnormality that we require the completion of a special heart chart, when we carefully ask for the position and distance of the apex beat from the midsternal line. We are not prepared to accept the judgment of our examiners as to blood pressure, pulse and build being normal but require exact readings and then judge for ourselves. Should we not in every case ask for details of the position of the apex beat and its character? An apex beat that is not visible or palpable or that is diffuse and heaving requires special investigation. Undoubtedly we would at first receive many worthless answers, but should we not endeavor to educate our examiners in this detail just as we have done regarding blood pressure? The suggestion of establishing standards of cardiographic examination is excellent and necessary. I hope someone will soon furnish us with a standard system of such measurements that will be not only authoritative but uniform in its application and interpretation.

A history or previous record of high blood pressure, and especially raised diastolic, with normal readings on examination in those who have passed middle life should put us on our guard. On investigation we frequently find that the family physician or the examiner attempts to explain the reduction of blood pressure by the extraction of a tooth, removal of tonsils or some other equally improbable therapeutic measure. In such cases I believe we are frequently dealing with an applicant who has a failing

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heart muscle, and we should demand a careful heart investigation if we are to consider. A recent case may be of interest to you. A very prominent citizen, fifty-eight years of age, was examined by a Professor in a University. The family history, personal history and examination were clear, with blood pressure reported 120/80; sample of urine submitted was clear in every way. There was a previous record of raised blood pressure six years ago, viz., systolic, 162, diastolic, 112; blood pressure reported a few months before our examination, 140/100, 130/90, 140/105; 10 milligrams of albumin had been found and subsequently Q'd. We wrote our examiner and he insisted that he had made a very careful and thorough examination and could find nothing wrong; he even went so far as to state that if it were his own money that was involved he would insure the applicant. We had an examination by another excellent examiner, who found his blood pressure 160/100 but could find no other abnormality. The applicant admitted that some years before he was out of sorts and at that time had a somewhat raised blood pressure, with symptoms of indigestion. Our second examiner considered him better than the average risk with such blood pressure. Agency pressure was brought to bear, but we declined. Four months later he died, suddenly, of heart disease. I understand he obtained insurance in another company subsequent to our declination.

Neither agency pressure nor possible competition should cause us to make hurried decisions. We should investigate carefully and make use of every available diagnostic aid. The motto of our Underwriting Committee is "Festina Lente".

DR. CHAPIN—The arterio-sclerotic heart presents a very important and very difficult problem in medical selection. As Dr. Birchard says, studied by lives it is the greatest single mortality producer we have to deal with, and studied by amounts of insurance it is still more important because it affects chiefly the older age groups and the largest policies. We have all encountered sudden deaths of recent applicants in this class who

had passed our usual barriers. This is a pathological condition in which symptoms rather than physical signs give the warning. The clinician depends greatly upon the history which he elicits from a highly co-operative patient, while we who need a complete history just as much must often be content with one obtained from an applicant who tells the truth with penurious frugality. Because of this handicap it is imperative that we have an especially comprehensive examination of the cardiovascular system.

Dr. Birchard has devoted most of his admirable paper to a consideration of two important diagnostic methods, the electrocardiograph and the X-ray, which should help us materially to meet this particular problem. The value of the electrocardiograph in medical selection has been discussed at length here this morning, and I can only add my assent to the high appraisal of its importance in our work. As the writer suggests, we medical directors must be able to read and interpret electrocardiograms accurately if we are to obtain from this source the help which it offers and which we sorely need.

Second only to the electrocardiograph as a means of detecting the early arterio-sclerotic heart the writer places the X-ray. Even as we now use it the radiograph gives us reliable information as to the size and shape of the heart and the width of the aorta and it enables us to estimate heart volume with reasonable accuracy.

Dr. Birchard has contributed a timely paper. Careful investigation of our older applicants for large amounts, as outlined by him, will do much to prevent heart disease among medical directors.

DR. BIRCHARD—Mr. Chairman and Gentlemen: To answer Dr. Livingston's reason as to why I think 'left axis deviation' is of importance from a prognostic standpoint, I would put it this way: I see a lot of patients that come from doctors in Montreal, who are sent for electrocardiograms. The majority of these people who come for electrocardiograms, are suffering

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from angina pectoris or chest pain of some sort. Of those that turn out to have chest pains of cardiac origin, true angina pectoris, a very very large proportion exhibit so-called 'left axis deviation'. In other words, the incidence of 'left axis deviation' amongst these people is certainly very much higher than it is amongst the normally healthy general population.

Now I have no data as to the incidence of left axis deviation in healthy people in various age groups. All I have is impressions, and I am very skeptical of impressions, but the proportion of people with left axis deviation in the angina pectoris group is, I am convinced, very much larger than it is amongst so-called normal people. A probable reason is suggested by the work of Louis Gross, who, by injecting hearts of various ages, has shown that the senility process in a heart seems to consist to a very considerable extent of a thinning out of the capillary network on the right side, very much more than it does on the left. I have a suspicion that left axis deviation is associated with that thinning out of the capillary network in the right ventricle. If it occurs unduly early it is an indication of premature senility. That is an impression and suspicion and is not proven by any means.

Further, with regard to the Size of the Heart—This is just a little additional which I intended to give this morning, when I became a little too long winded for my quota of time. People's opinions differ as to the allowable variability in the silhouette area in normal hearts, as you obtain areas from six-foot or ten-foot X-ray plates. Some authorities tell you it may vary plus or minus 32.5 per cent from the mean. Now I ask you to think just what this means in heart volume. It is heart volume we are interested in: not silhouette area. Anyone who is interested in boats will appreciate that a boat 132 feet long is very much larger than a boat 100 feet long, but how much bigger is it. I have taken a boat 100 feet long and one of 132 feet because those two boats vary 32.5% in deck area (the homologue of heart silhouette area) from the average of the two. Now the boat 132 feet long is 232% of the size (or tonnage) of the

boat 100 feet long. Those who have had any experience with sailboats will appreciate the significance of that. If the statements of those authorities are accepted, it means that a man weighing 232 lbs. can have a heart of exactly the same size as the man weighing 100 lbs. and both be considered normal. That is as unlikely as it is that the United States is going to get its War Debts paid! (Laughter.) It may be true that these two men may have equal hearts of the same size (and both have normal hearts) but it appears to me extremely ridiculous.

A variability of plus or minus $32\frac{1}{2}\%$ from the average in silhouette area means that in the average sized person the heart borders need be only moved outwards a little more than one centimetre and a half that the heart volume may be doubled. To detect this one must have very much more accurate methods than, by which to appraise volumes and the X-ray method is our only resort. Prof. Weil of Philadelphia designed an apparatus four or five years ago consisting of an electrocardiograph and photo-electric cell; these two working as an accessory to an X-ray outfit for synchronising X-ray exposures and any part of the cardiac cycle. During inscription of the 'R' deflection of the electrocardiogram a beam of light from an oscillograph type of electrocardiograph would be thrown on a photo-electric cell (the same apparatus which is the heart of talking-moving pictures), which in turn would activate the switch of the X-ray transformer. Now it is possible, with the newer apparatus coming on the market this year to get excellent exposures of a heart in even $1/120$ th second: a half cycle of the ordinary sixty cycle electric light current. With this apparatus you will be able to pick out a single impulse of the current ($1/120$ th second in duration) and impress that upon the X-ray tube and get perfectly good exposures. With Weil's apparatus in addition, you can synchronise that instant with any part of the cardiac cycle you please. Making the exposure at the end of a systole, you should be able to get a photograph with the aortic valves closed, the aorta comparatively quiet and empty of blood. You will be able, I have no doubt, in advanced cases of rheumatic disease, to

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demonstrate the calcification in the aortic and mitral valves, and in arterio-sclerotic disease, calcification of the aorta and perhaps even pick up calcified coronaries.

In the next couple of years one expects a tremendous improvement in the radiography of the heart and then, we, as life insurance people, should make use of our elaborate statistical departments to take these carefully made X-ray plates, made under standard conditions at a certain definite phase in the cardiac cycle, to get some extraordinarily good information as to the normal size of the heart. My guess is that five years hence we will be able to grade the hearts into groups as to size, just as accurately as we grade blood pressure groups or body weights, and that this matter of heart size will be vastly more important than weight and probably more important than blood pressure, as a prognostic factor. We will then have something by which we will be able to earn the salaries which we get from the insurance companies.

Now this antero-posterior plate is the only one, I believe, which will lend itself to accurate measurements for statistical purposes. The left anterior oblique, which is so much preferred by cardiologists, undoubtedly gives good expositions of the aorta, pulmonary artery and general heart outline, but it does not appear to be adaptable to measurement. For that reason we, as life insurance people, will have to depend on the antero-posterior plate rather than the left anterior oblique plate, though the latter undoubtedly gives you more information for the man who is simply making diagnoses. Heretofore with the antero-posterior plate either the heart is enlarged or not enlarged. One X-ray man might give you one opinion and another X-ray man might give you a different opinion. We must have accurate measurements. At the present time no one knows what is normal: no cardiologist or X-ray man knows with any accuracy. I would like to cite the case of Dr. Rossiter who was in Montreal last year. He spoke to a small group one night at an informal affair, and after the meeting I asked him how he knew what was a normal sized heart. "Well," he

said, "I size up the man as he comes into the room. I observe his general appearance, his build, whether he is muscular or is not muscular and from that I decide what is a normal sized heart for that man." That is absolutely useless to us. That may be perfectly good to Rossiter. He does not have to give accurate opinions. We have to do better than that and we have got to have measurements and nothing else. Also apropos of the very excellent plates he exhibited showing atheromatous changes in the aorta, and he had some beautiful ones:—In answer to a question as to how long it had taken him to collect those plates, he said it had taken nine years to collect them in a clinic that was running several hundred examinations per week: that is, a dozen good plates were picked out of perhaps a quarter of a million cases. That is perfectly all right for him, but we have got to spot our diseased aortas much more readily and much more frequently than that, otherwise radiography of the chest is not going to do for us as much as it should. (Applause.)

FLARIMETER TESTS

(Report of Progress)

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The first thousand flarimeter reports from 70 selected examiners showed such good correlation ⁽¹⁾ with independent Company action on the cases that tentative rules for selection were drawn up and have been in use since the first of this year. These rules enable us to throw border-line cases one way or the other whenever a flarimeter report is available. The answers to a questionnaire sent to our examiners using the instrument revealed that some considered the test too long; others felt it was of sufficient value to justify expenditure of the time required.

We presented a shortened test at last year's meeting of this Association. This may be abbreviated further by omitting Test IV, which is a repetition of Test I, and also by omitting Test III, leaving Tests I, II and V only. When so applied it takes nine minutes, or about one-half the time. We wish to state, frankly, that we are not in favor of this change from our present procedure and have mentioned it only because of the oft expressed opinion that a much shorter test was necessary and might be developed. It undoubtedly may be, but only at the expense of very important information so necessary for checking and interpretation.

The short test should not be attempted until the examiner has had sufficient practice with the old test to be sure of his own technique, and even then only when he is confident, from the applicant's performance of the vital capacity blows, that the first

(¹) See our paper on "Interpretation of Flarimeter Tests", Am. J. Med. Sci.

trial of Test V will be successful. When applied with judgment, however, it should save considerable time without sacrificing the most important features of the test.

If the responses to exercise are unsatisfactory, in particular, if the length of the final blow is less than 40 seconds or T_{20} less than 25 seconds on adult males, then, to make sure that the failure was not in performance, Tests III and IV are given to get basal responses, and then Test V is repeated. When the applicant is normal, Test V is almost always satisfactory in this second trial. On the other hand, if the first trial failed because of impairment, the second trial is usually as bad, if not worse than the first. *This comparison furnishes a very sensitive index of circulatory fitness, but consumes a little more time than the present test.*

Omitting Test III (the small orifice blows before exercise) has two disadvantages—(1) in clinical work some patients cannot be given the exercise so that on these only Test III is available, (2) Test III is necessary as a base to determine accurately the effect of exercise upon the responses. Without it, Test V can be compared only with average normal values, and the differential is lost. For the responses after exercise may appear normal and yet be markedly reduced, if those before exercise are much above normal. Nevertheless, if Test V is satisfactory, it is safe to assume that Test III would have been at least as good, if the performance had been as good.

When the applicant is slow at performance, it usually saves time to try Test III before Test V, in other words, to stick to the regular order of Tests I to V. Indeed the standard flarimeter technique is designed to give both examiner and applicant sufficient practice in performance to make sure that the responses are correct and characteristic.

STANDARD EXERCISE TEST

Our experience with the flarimeter has emphasized the importance of a complete picture of the response to exercise. We have, therefore, steadily amplified the use of the exercise test until it now has eight responses associated with it. It is practically im-

possible for all of these to be freaks so that inconsistencies may usually be properly discounted at once without the necessity of correspondence. We now feel satisfied that the reports may be safely used in selection, as the exercise test is practical, scientific and standard, and the responses, therefore, really informative and comparable.

Our latest technique differs slightly from that of last year in that the step exercise begins on the minute. Ten seconds are allowed after the exercise to begin the blow, which is usually over in about twenty seconds, that is, by the end of the second minute. Thirty seconds later the systolic and diastolic are taken, that is, one minute after exercise. The pulse is counted from the end of the third minute for fifteen seconds, then the systolic two minutes after exercise, and the final blow is begun at the end of the fourth minute, or two and one-half minutes after exercise. T_{20} , the maximum systolic, and the length of this blow, are taken, just as in Test III, before exercise. The schedule is smooth, everything begins on the minute or half-minute except the first blow, which is started with dispatch immediately after the exercise. The systolic response to standard exercise is thus determined four times, twice at rest and twice during the final blow. Shortness of breath is measured twice by the two lengths of blow, while the diastolic and pulse are each read once.

" T_0 "

In our first report to this Association, two years ago, we gave statistics on the sudden drop in systolic pressure in the beginning of the flarimeter blow. This drop occurs because the intrathoracic pressure is suddenly increased to nearly 20 mm. Hg. when the blow begins which, of course, dams back the blood in the cistern of Keith. The median systolic drop was 26 mm., the variability about one-half. Our experience with this response was not satisfactory, and so it was omitted from the routine tests.

There is so much literature on responses of this type, however, that further study seems desirable. The postural test, the fundamental physiology of which was worked out by Erlanger

and Hooker ⁽²⁾ in 1904, and developed by McCurdy ⁽³⁾, Crampton ⁽⁴⁾, Sewall ⁽⁵⁾, Schneider ⁽⁶⁾, and Addis ⁽⁷⁾, is essentially merely a method which delays venous return to the right heart. Thus, normally, the systolic drops, the diastolic rises and the heart accelerates for ten or fifteen seconds after changing from the horizontal to the vertical posture. This corresponds to the Valsalva reaction but is much less pronounced.

The best work on the postural test which we have seen is that of Addis. With an assistant to read the pulse simultaneously he measured the systolic and diastolic of subjects in various postures before and after exercise (100 hops in 50 seconds, by metronome). He gives complete frequency distributions of the systolic (S), diastolic (D), pulse pressure ($P=S-D$), rate (R), and the pulse pressure-rate product (PR), their variations due to exercise and to posture both before and after exercise. Of still more interest than his basic data on 310 normals are 580 observations on 156 neurocirculatory soldiers. The physiology of the test is most clearly shown by experiments in which picked volunteers were tested by giving 100, then 200, then 300, then 400, then 500 hops, a total exercise of 1,500 hops (2 per second).

There is no doubt about the reality of the beautiful results obtained by Addis, and his theory is very appealing. Unfortunately, while he obtained the standard deviations of all his constants, he did not apply these to determine the probable errors of the tests. When this is done it proves that the postural effect is so small that even his average of five tests on different days is not enough to differentiate positively a neurocirculatory patient from a normal. Table 1 summarizes his results and shows that the probable errors of single tests (Columns 4, 7, 10) are much larger, with one exception (Pulse pressure, Column 10), than the average differences

(2) Erlanger and Hooker, Johns Hopkins Reports 12, 145, 1904

(3) J. H. McCurdy, Am. Phys. Educ. Rev. 15, 421-32, 1910.

(4) C. W. Crampton, Am. J. Med. Sci. 158, 786-816, 1919.

(5) H. Sewall, Am. J. Med. Sci. 158, 786-816, 1919.

(6) E. C. Schneider, J. Am. Med. Ass'n. 74, 1507, 1920.

(7) T. Addis, Arch. Int. Med. 30, 240-68, 1922.
" " " " 29, 539-553, 1922.

between the neurocirculatory (N.C.) cases and the normals. Columns 2, 3, 4 show the differences in blood pressure, pulse rate, pulse pressure and the pulse pressure-rate product between lying down before, and again immediately after, exercise, while the last six columns give the differences produced by standing up after lying down both before and after exercise. A rise in response is considered positive, a fall negative.

TABLE 1
COMPARISON OF ADDIS' RESULTS ON 310 NORMALS AND 156
NEUROCIRCULATORY

RISE IN	AFTER EXERCISE			ON STANDING					
	(100 hops in 50 Secs.)			BEFORE EXERCISE			AFTER EXERCISE		
	N.C. Cases	Normals (\pm)		N.C.	Nor. (\pm)		N.C.	Nor. (\pm)	
Systolic	27	30	25	-16	-4	25	-31	-11	28
Diastolic	-11	-12	17	5	6	17	11	9	16
Pulse Rate....	31	29	25	25	19	24	24	15	25
Pulse									
Pressure....	38	43	28	-22	-11	16	-43	-16	25
Pressure-Rate									
Produce/100....	61	61	34	-11	-0.4	20	-33	-10	33

(The \pm values are standard deviations of a SINGLE test.)

This table demonstrates that the postural responses are of the Valsalva type, only less pronounced, that normals show more effect after than before exercise in systolic, diastolic, pulse pressure and pulse pressure-rate product, but less effect on pulse rate (Columns 6, 9), that the neurocirculatory show more effect before than normals after exercise in systolic, pulse rate, pulse pressure and pulse pressure-rate product, but less in the diastolic (Columns 5, 9) and that after exercise the differences are accentuated in all except pulse rate which is slightly changed (Column 8). The exercise test itself (Columns 2, 3) fails to show any important differences between the two types of cases. The neurocirculatory impairment is one of degree, but not of kind. All show the effect, but the neurocirculatory show it more. The trouble with the postural test is that the effect is so small that it is within the probable error of a single test.

Blowing at a fixed pressure is a much more effective method of impeding the venous return. In the flarimeter blow the initial

systolic drop is usually four or five times as large as the postural effect. In fact, the pulse pressure is often reduced practically to Zero, so that no sound is heard. If there is any virtue in such responses, the flarimeter test should have a much larger chance of success. But we consider the initial response to the blow the least reliable, and so do not include it in the routine.

To make sure that no possibility is overlooked, however, we are making a special study of a standardized initial response " T_0 ", which is the number of seconds required for the systolic to recover its original level, after the blow begins. Its median value for normal adult males, taken from the charts in our 1929 paper, is given as a function of the length of blow (T_m) in Table 2. Apparently, the longer the blow, the more delayed is this response, at all ages, the effect increasing with age, probably due to the nervous system becoming more stable.

TABLE 2

No. TESTS	T_m (SEC)	MEDIAN T_0 ON 88 NOMALS MEDIAN T_0 (SEC.)	
		AGES UNDER 30	ALL AGES
11	30-39	13	11
43	40-49	16	15
68	50-54	15	16
48	55-59	17	19
27	60-70	19	22

Some may wonder why T_0 is chosen, instead of the systolic at some standard interval, say twenty seconds after the beginning of the blow. Call this " S_{20} ", and then the systolic response would be $(S_{20}-S_0)$, where S_0 is the systolic base value. The advantages of T_0 are threefold: (1) It is more stable than $(S_{20}-S_0)$, because the systolic is changing rapidly, (2) it is automatically referred to the proper base without arithmetic, and (3) it measures the end of the initial stage, while S_{20} may represent any stage of the blow. Their stabilities are shown in Table 3.

TABLE 3

STABILITY OF RESPONSES								
Response	No.	Med. Range			Quartiles		Range	
	Tests	Median	a.d.	Repeated				
			(±%)	Trial				
			(88 Normal males)					
T ₀	181	17	35	37	25	13	53	7
S ₂₀ -S ₀	198	5	120	125	10	-0.2	35	no sound
T _m	199	54	20	16	62	43	91	21
(22 Athletes, Males)								
T _m		52	19	13				
T ₂₀		45	18	11				
S+		40	28	20				

Repeated trials of T₀ on the same subjects agree within a median range of 37 per cent. which is about four times the stability of (S₂₀-S₀).

The correlation charts 1 - 3, on the normal adult males, show that T₀ is not correlated with T_m, is slightly correlated with (T_m-S₊), but is most correlated with T₂₀. Therefore, we consider T₂₀ and T₀ related in significance and as it is less difficult to observe may perhaps prove to be the best response of all, but we must for some time include as many responses as possible in the time allotted to serve as checks on one another.

It is premature at present to burden our examiners with T₀. We have mentioned it in the revised edition of the pamphlet on Determining Circulatory Fitness, so that any who are interested may try it in their own work. A number of selected examiners are observing it routinely with considerable satisfaction, as are also the clinicians who are studying the flarimeter test. If desired, it may be added to the routine without difficulty at any time after the examiners have mastered the rest of the technique, for it does not lengthen the test.

FLARIMETER RESPONSES AS A FUNCTION OF AGE

Last year we presented data on 323 first-class adult male risks from eleven selected examiners, which indicated that the vital capacity decreases about one-half per cent. per year after age forty. The data on 746 such risks by 70 selected examiners are given in

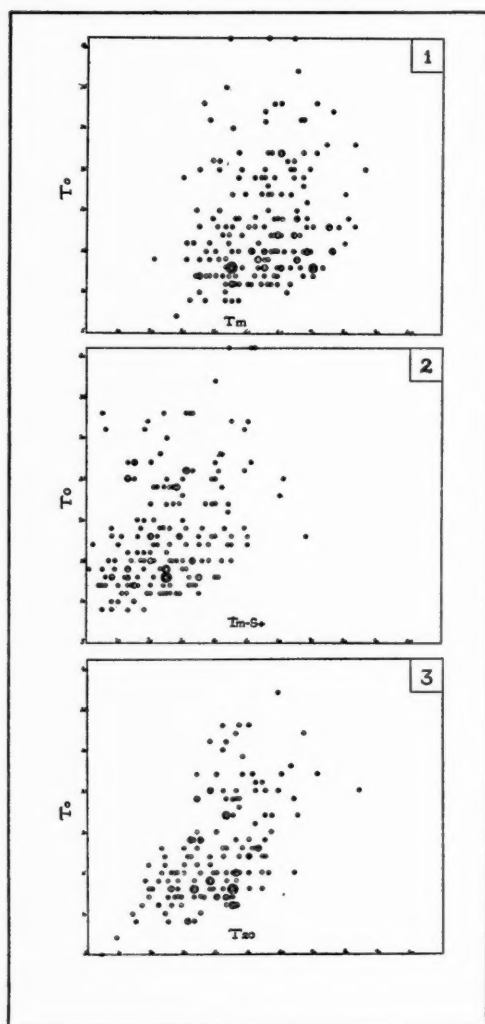


Table 4 and they confirm the earlier results. Vital capacity (expressed as % of normal by height) shows practically no correlation with age, decreasing less than 2 per cent. (107 - 105) from ages twenty to forty years. After forty each case has had one per cent. per year added to correct for the decrease with age, but the regression equation shows that this is just about one-half per cent. too much (the co-efficient is 0.56 ± 0.13 per cent. per year). In the future, therefore, the correction to be added will be only one-half per cent. per year over forty, and then normal males of all ages over twenty should have vital capacities above 90 per cent. by the flarimeter.

TABLE 4
FLARIMETER RESPONSES AS A FUNCTION OF AGE
(746 First-Class Risks, Males,
by 70 Selected Examiners.)

Ages (Yrs.)	Best Straight Line A=Age in Years			Corre- lation (r. %)	No. cases
20 - 44	Av. Vital Capacity	$\bar{V} = 107$	-.09 (A - 20)	-5 ± 3	569
40 and over	(% of Normal)	$\bar{V} = 105$	+.56 (A - 40)	21 ± 5	177
20 - 44	Av. Length of Blow	$\bar{T}_m = 57$	-.20 (A - 20)	-14 ± 3	569
40 and over	Av. Length of Blow	$\bar{T}_m = 54$	-.30 (A - 40)	-15 ± 5	177
15 and over	Av. Irritability	$\bar{T}_m - S_+ = 23$	-.19 (A - 20)	-16 ± 2	704
15 and over	Av. Irritability	$\bar{T}_{20} = 40$	-.13 (A - 20)	-14 ± 3	688

Table 4 shows also a negligible decrease in \bar{T}_m with age. This symbol represents the average length of small orifice blow at a given age. Moreover, the correlations are only 14 and 15 per cent., which indicates that only one per cent. of the variations in \bar{T}_m can be predicted from age. \bar{T}_m is 57 seconds at age 20, it decreases 0.2 seconds (0.4 per cent.) per year from 20 to 40, and 0.3 seconds (0.6 per cent.) per year after forty, but these differences in rate are within the probable error.

The two measures of irritability, T_{20} and $(T_m - S_+)$ show the same correlation with age, with rates of decrease which are also quite negligible in practice. All this is very fortunate, for it means

that no tables will be needed for the interpretation of these indices of irritability and shortness of breath. Single border-lines will suffice for all ages above twenty years. T_m , $(T_m - S_e)$, and T_{20} , therefore, are physiological constants such as are the temperature and pH of the blood. They represent fundamental attributes of circulatory fitness.

Incidentally, the smoothness of these results, their agreement with the smaller sample studied last year, and with our expectations from physiological theory, must indicate real significance. The random fluctuations, great as they are, have not prevented penetration to the systematic trends in these constants. Apparently, samples of a thousand are not needed for this if the cases are carefully selected.

FLARIMETER IMPAIRMENTS

A detailed and careful analysis was made of the reports on the first 524 impaired adult male risks, which permitted satisfactory classification. The tables are extensive, but the groups small. We, therefore, thought it best to wait for additional material before presenting them. The percentages, however, are so outstanding that definite trends are clearly suggested, and consequently a brief comment on the analysis will be given.

We found that hypertension, murmurs, myocardial change and pulse irregularities had abnormal flarimeter responses associated with them more often than did albumin, casts or glycosuria. The order of frequency with which these abnormal responses appeared was T_r , T_e , V, T_m , T_{20} , and $T_m - S_e$. The highest percentage (73) of abnormal Test V occurred in twenty-four cases showing myocardial change. Responses indicating irritability occurred in about 20 per cent., and shortness of breath in about 50 per cent. of the impaired cases. Why are these percentages so small?

The frequency with which abnormal responses occur are, of course, functions of the border-line chosen and these are so severe that 6 per cent. of apparently first-class risks failed to pass. In the impaired cases 26 per cent. showed normal flarimeter reports. There must be mistakes hidden among these reports, although they were all sent in by carefully selected examiners. The re-

sults, however, agree so closely with those from a smaller group previously analyzed that we must accept their trends as real. Our answer to the above question is simply that abnormal flarimeter responses have to be considered as indications of actual impairment. Once this is accepted the situation becomes clear.

Cases with normal reports contribute nothing to the percentages. Those with a single flarimeter impairment contribute only to that class. Rejected and clinical cases, naturally, are associated with multiple flarimeter impairments, and so the percentages are higher. If other impairments, such as hypertension, tachycardia and overweight were compared among themselves, the percentage would also be small. It is not necessary for everyone with a murmur to be short of breath, any more than it is to find tachycardia always associated with hypertension.

We believe that abnormal flarimeter responses show properties in every respect characteristic of impairments.

DR. DEWEES—When I accepted Dr. Rowley's invitation to discuss this paper, I little realized the gravity of the undertaking. Neither did I realize that I was probably the last one of a sizeable list whom he had similarly solicited but who were wise and declined.

I say this with no disrespect toward the authors of this paper, but rather with a profound respect for them, for they have been pursuing a highly scientific problem for five years and pursuing it with untiring energy and in a painstaking manner.

The investigation conducted by Dr. MacKenzie and his co-workers through the use of the Flarimeter has had to do with certain fundamentals of clinical and pathological physiology.

I ask you to permit me to report my impressions of the technique of their approach to this problem of pure research, rather than to discuss the paper as such. My reason for asking this is because I believe it is too early in their studies, and their work is yet so far from completion that it does not permit of critical analysis, in so far as practical application is concerned. After studying their paper carefully and after re-

viewing their former publications on the Flarimeter, it was my pleasure to spend a day with Dr. MacKenzie and his co-workers in order to observe their methods of research and learn more intimately the nature of their problem.

We spent hours going over case reports and considering some of the problems involved in the study of individual cases, and theorizing on the reasons for the reactions which these observers have obtained. Dr. MacKenzie completed his discussion by saying, "Doctor, we haven't a single conclusion to offer". Such is the frank expression of these honest researchers.

In their studies they have used every effort not to be deceived themselves by their findings.

Neither the Flarimeter nor any other mechanical device can determine cardiac longevity. This obviously is impossible because of the many biological and physiological factors which are intangible and unmeasurable.

It, therefore, behooves us more and more to use every means at our disposal, together with astute clinical observation, to determine cardiovascular efficiency as well as absence of, or degree of progress of pathology in every other organ and tissue in the body.

The Flarimeter report, when evaluated by the skilled observer, does give, I believe, a surprising amount of information concerning heart efficiency at the time of study. More than this, it gives very suggestive evidence of vascular efficiency and probably of arteriole response to certain central stimuli dependent upon oxygen deficit and fluctuation in carbon dioxide (CO_2) concentration. As research progresses and Dr. MacKenzie and his co-workers learn more concerning the meaning of the Flarimeter response, it seems altogether possible that some light may be shed upon the integrity of an individual's sympathetic and autonomic nervous systems. An estimate of renal behavior seems also a probability as well as to certain disturbances of metabolism. It is not beyond the realm of possibility, if these theories as to why certain things happen with this test are correct, that blood changes and even endocrine disturbances may be fairly accurately determined.

I am convinced this research problem is in good hands, and that these workers merit enduring patience and long waiting on the part of every member of this association. The best tribute I believe we can pay is to assume the attitude of suspended judgment, looking forward to the time, possibly years hence, when we will listen in these meetings to conclusions which will be of invaluable assistance to the medical director in his highly specialized task of scientifically estimating longevity.

DR. MACKENZIE—Yes, I would like to. Gentlemen, I don't want to take up your time or that of the other papers, but there are two or three things that I want to say. There were placed in your hands pamphlets. Those are the rules that we are using in the Home Office today for the application of the flarimeter and we are permitting the flarimeter now to be one of the straws that tell us in which way the wind is blowing when we are selecting a case. Please don't go away with the idea that we are selecting solely on the results of any flarimeter report. We are not. But we are using it more and more as an aid, and as we get more and more experience with it, we are becoming more and more convinced as to its value in helping us to arrive at some idea as to the condition of the applicant.

I want to read one quotation and then I am done. It so beautifully expresses my own feeling about our flarimeter work. It was by Dr. Fellows in his very admirable paper. He makes this statement: "New criteria must be established, new statistics made available, new methods and instruments carefully appraised before selected for use. All of this requires patience, judgment, and a healthy, withal a fair, skepticism. If attacked in this manner, much of advantage is bound to accrue." Gentlemen, we are just as skeptical as you are and we are going to continue working on this test. We want you to feel, as Dr. Dewees stated, that we have arrived at no definite conclusions, but we have some very definite opinions. However, those opinions are open to change. We are not hide-bound about it at all. Thank you very much. (Applause.)

DIABETES AS A LIFE INSURANCE
SELECTION PROBLEM

BY WILLIAM G. EXTON, M. D. AND ANTON R. ROSE, PH. D.

The Prudential Insurance Company of America

INTRODUCTION

When a question of sugar in urine arises in a life insurance application, the medical director, whose opinion will govern his company's action on the risk, must decide for himself whether or not the applicant has diabetes, because diabetes is the issue of paramount importance in every consideration involving sugar in urine and life insurance. It is also true that the medical director, whose duty it is to approve, rate or reject risks according to the predetermined rules of his office, must depend upon certain criteria which distinguish diabetes from the many and various other conditions characterized by sugar in urine, and it is our present purpose to discuss, describe and evaluate the criteria which make possible most efficient selection.

To differentiate among the many and various conditions characterized by sugar in urine, clinicians can correlate the information derived from a number of different sources. Thus the clinician actually sees and examines a subject who willingly reveals a frank case history and complete symptomatology. He also has the advantage of knowing the nature and effects of treatment, and makes his diagnosis by tempering all these impressions with information concerning glycemia and excretion gained by perhaps repeated estimations of his subject's capacity to handle carbohydrates.

The reverse attitude on the part of his subject compels the medical director to make his decision under much less favorable circumstances. Thus, the very important matters of symptomatology and therapeutic tests are conspicuous by their absences, and the case history he gets is more than likely misleading if it

amounts to anything more than an accidental finding of sugar. It thus appears that practically the only information available for his decision is the data that the medical director may be able to secure concerning glycemia and excretion, and he regards himself as fortunate when even this is obtainable without bias.

Although the mutual advantages are so great as to make it expedient to use similar criteria whenever possible, the opposite situations of clinician and medical director logically suggest that clinical and insurance practises need not necessarily coincide.

SUGAR IN URINE

As generally applied, the term "sugar" in urine means anything that reduces copper, bismuth, iron, picric and dinitro salicylic acids, etc., or any of our other reagents. The number and variety of such reducing substances are very great but it is noteworthy that glucose (dextrose) is the only one of them all which characterizes diabetes. Therefore, no matter what the significance of any of the many others may be, urines which contain only reducing substances other than glucose are not diabetic, and if we had a specific glucose test, many mistakes would be ipso facto saved and much trouble and confusion avoided. To illustrate: at least four cases of pentosuria, an apparently harmless anomaly, were erroneously reported last year as diabetics by our laboratory, and in his study of 9,000 glycosurians Joslin found only 80 to 85% diabetic.

Besides molecules with reducing groups like the other sugars which closely resemble glucose, there are numerous other substances which bear little or no structural resemblance to glucose but which, nevertheless, give misleading reduction compounds with our sugar tests. In fact, there are so many of them that mention would be futile, but it is interesting to note that they include not only metabolic products but also drugs in common use and food adulterants.

Thus, in our routine run of urines, 4,837 that gave slight but definite reductions with Fehling's and Benedict's solutions were also subjected to dinitro salicylic acid and phenylhydrazine tests.

Of these, only 2,571, or 53%, showed glucosozones, and in the remaining 2,266, or 47%, although many gave values of 0.3%—0.4%, and rarely even 0.5%, it was impossible to establish the presence of glucose.

Therefore, even though our sugar tests reduce, once it is known definitely that the urine in question does not contain glucose, quick and certain action on many "sugar" in urine cases becomes possible. Urines giving values higher than 0.3—0.4% by quantitative tests very likely contain glucose, but as long as it is customary in insurance work to examine one or more repeat specimens in cases having a finding or history of sugar, it is suggested that it may well be worth while to treat one of the specimens by some method which differentiates other reducing substances from glucose. If we do not do this, we must falsely assume that all urines which reduce our routine sugar tests contain glucose in spite of the fact that diabetes can be instantly and finally excluded from consideration when the urine does not contain glucose.

DIABETES

A composite of the leading clinical authorities would define diabetes mellitus as a clinical entity of chronic progressive nature characterized by glucosuria and hyperglycemia resulting from a deficiency of insulin due to functional or organic disease of the Islands of Langerhans. The disease affects all ages, and heredity, obesity, infections, and endocrine irregularities are recognized as predisposing if not etiological factors. Its most prominent symptoms are loss of strength and weight, hunger, thirst, polyuria and pruritis. Its serious complications are due to acidosis and arteriosclerotic changes, and termination usually results from coma, gangrene, or cardiorenal crisis. Statistically and otherwise diabetes in all its clinical aspects has been the subject of a great deal of careful study, and information concerning its incidence, mortality, course, physiology, pathology, treatment, etc., is so readily available that only those diagnostic features will be here considered which may be helpful in differentiating diabetes and other conditions exhibiting glucose in urine.

The medical director sees diabetes as a somewhat common impairment with abnormally high mortality characterized by concurring hyperglycemia and glycosuria, and because many diabetics who want life insurance try to mask their condition by grooming themselves for examination with dieting, liver extracts, insulin, etc., he must naturally suspect diabetes in every case presenting a history or finding of sugar in urine. Although conditions differ in every case, every such suspicion must be substantiated or dissipated. Therefore, every sugar in urine case is a problem of diabetic probabilities which must be solved, and to get the right answer the medical director must reckon with and practically wholly rely on the results of a sugar tolerance test.

SUGAR TOLERANCE TESTS

The sugar tolerance tests now so commonly employed in clinical routine are developments of successful research methods for the study of mechanism and measurement of an organism's ability to handle carbohydrates. Their extensive use has put us in possession of an enormous clinical experience which has taught us their limitations as well as their advantages, and as these in turn depend to such a considerable extent on the technics of the particular test, it is necessary to review the various procedures in use in the light of their application to life insurance practise.

Of 84 definite answers to the recent questionnaire referred to the Committee on Urinary Impairments 10, i.e., 12%, stated that they relied on single blood sugar determinations:—one on a fasting sample, 2 on a sample 1 1/2 hours after, 6 on a sample 2 hours after, and 1 on a sample 2 1/2 hours after some sort of test meal. No reasonable explanation of the advantages of any of these over other procedures is apparent. On the contrary, theoretical and practical considerations point to all of them being unfair to both applicant and company. Single blood sugar tests are, of course, useful in clinical work and, as will be mentioned later, also in insurance work, but no matter how used they are not efficient for specifically diagnosing or excluding diabetes and it would be better to discard them altogether from insurance prac-

tise because they lend themselves too easily to error, imposition and injustice.

The nature of the test meal is, of course, very important because it influences other conditions as well as the results of a test, and the 100 definite answers to the questionnaire of the Committee on Urinary Impairments is therefore of real interest.

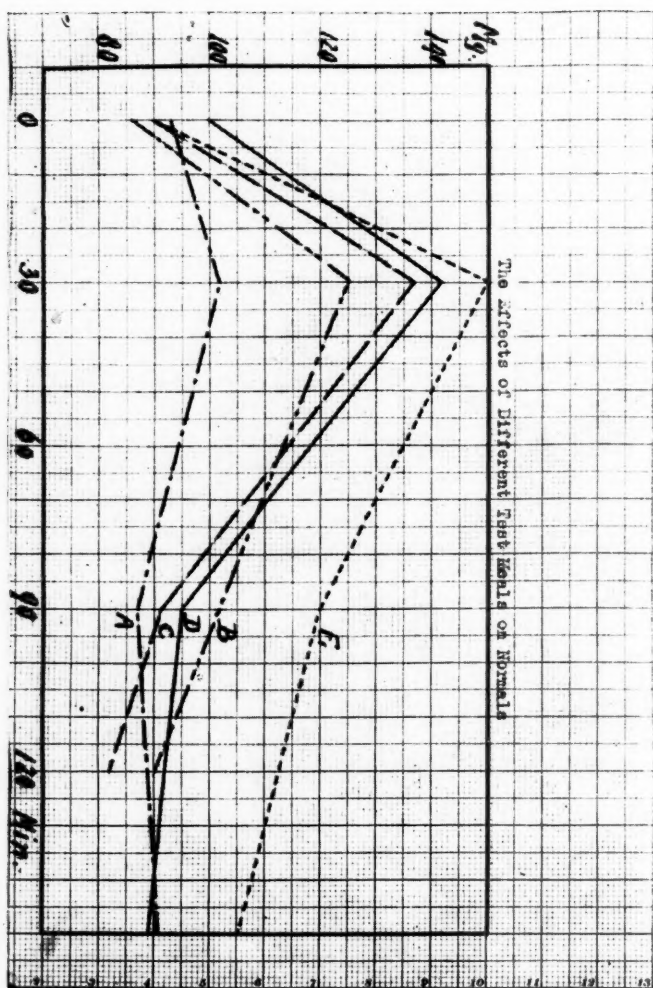
Thus:

Carbohydrate meal given by	2	companies
Carbohydrate meal with added glucose given by....	2	"
Glucose depending on body weight given by.....	1	"
Glucose 50 grams given by	11	"
Glucose 75 grams given by	9	"
Glucose 100 grams given by	75	"

Clinical practise also shows a wide divergence in the matter of introducing carbohydrates into an organism for test purposes, and to illustrate the extremes, one might contrast the very modern tendency to introduce glucose intravenously, with carbohydrate meals like Van Noorden's bread-stuffing. If we note that the intravenous method is expressly designed to eliminate irregularities which result from complicating the mechanics of carbohydrate utilization with the vagaries of absorption and digestion, it will occur to us at once that the results of sugar tolerance tests are much more likely to be distorted by other carbohydrate meals than by pure sugars.

There are, besides this, insuperable practical difficulties in having all applicants ingest the same kinds and amounts of other carbohydrates than pure sugars which destroy the uniformity and clarity of results. Carbohydrate meals therefore belong in the same category as single blood sugar tests and had best be discarded altogether from insurance practise.

As the answers to the questionnaire indicate that none of the companies test with cane or indeed any sugars other than glucose, we can limit the present discussion to glucose, and note that while the practise of ingesting glucose according to body weight has a fetching air of exactness about it, a large experience has



- A Response of 16 normal and 4 non-diabetic patients to a carbohydrate meal equivalent to 50 grams glucose (Rowe and Rogers).
 B Response of 12 normals to 50 grams glucose (Prudential).
 C Response of 8 normals to 75 grams glucose (Prudential).
 D Response of same subjects as A to 100 grams glucose (Rowe and Rogers).
 E Response of 3 normal and 1 non-diabetic patient to 125 grams glucose (Rowe and Rogers).

demonstrated its falsity and led to its final "debunking" from clinical practise. It therefore belongs in the same category with single blood sugar tests and carbohydrate meals, and will similarly improve matters when discarded from insurance practise.

The answers to the Committee questionnaire give 100 grams as the largest and 50 grams as the least amount of glucose administered for test purposes. Concerning the differences between 50 and 100 grams it seems that 100 grams is probably larger and 50 grams perhaps less than necessary. It depends on other conditions and the manner of interpreting the test. As a compromise, 75 grams of glucose seems to meet all requirements and is otherwise quite satisfactory. In any event, the relative results of giving either 50 or 75 grams of glucose when tests are otherwise satisfactorily carried out are so similar that special symbols for amounts of glucose are unnecessary as indicated by the chart on opposite page.

Taking up the Committee's questionnaire again, 27 companies examine 1 or 2, 30 companies 4 or 5, and 37 companies 3 blood samples. To the question asking about time schedule for determining blood sugars, 94 companies gave definite answers describing 33 different schedules. Such a heterogeneity of plan to accomplish the same purpose by those endowed with the same understanding of the principles involved is striking enough to make one wonder why and how there can be so many differences, because there is nothing inherent in the sugar tolerance test to warrant such diversity of practise.

If each of these 33 different plans be studied separately in the light of our extensive clinical experience from the standpoint of the expediencies and exigencies of life insurance selection, it is apparent at first glance that some of them are inadequate in detail and that others are superfluous. Leaving the inadequate and superfluous out of consideration, it is also plain that with very slight and inconsequential changes here and there the remaining plans would mold themselves into a satisfactory uniform procedure, on the like of which alone will it be possible to build that *sine qua non* of life insurance—actual experience.

Those who are familiar with the great mass of available clinical data on sugar tolerance tests will agree that one or even two blood samples fail to supply enough information about an individual's absorption, threshold, glycemia, etc., for constructively interpreting results. They will also agree that while four or more samples may shed clearer light on some doubtful cases, the necessary information is almost always obtainable from three blood samples.

Of these, physiologists and clinicians unanimously agree that the initial sample is best taken in a fasting or as nearly as possible fasting condition, and because 20 of the 36 companies which do not require fasting specimens examine 3 or more samples we may infer that the matter of the practicability of obtaining fasting specimens is their only reason for abandoning, with other advantages, the great one of having a real basis for the sugar tolerance curve instead of a purely arbitrary assumption which may not fit the individual in question, with misleading results. It seems that 58 companies examine fasting specimens, and as a practical matter no greater difficulties are experienced in testing applicants before breakfast or three hours after a meal (in most cases around 11:30 A. M. or 5:30 P. M.) than at any other time.

The choice of time for taking the final blood sample of the test depends somewhat on the nature of the test meal and the way it is to be interpreted. As Dr. Folin has pointed out, the larger the dose of glucose the longer it will take for the blood sugar to return to the fasting or initial level. Smaller doses tend to shorten the test which is greatly in favor of giving less than 100 grams.

Our experience shows that after the ingestion of 50 or 75 grams of glucose the majority of normals will return to their initial values within two hours and that the great majority of diabetics will not. It is, therefore, safe to collect the final specimen two hours after the ingestion of 75 grams of glucose and exclude the diagnosis of diabetes if the value of the final two-hour sample falls within 20% of that of the initial or fasting sample, provided that the results in border-line cases are correlated with the peak sample and with excretion.

Although it has lost caste as a criterion, the peak sample, especially when higher or lower than usual, often lights the way to interpreting sugar tolerance curves correctly, and should always be taken into consideration even though we fully understand that the principal function of the peak sample is to give information about the subject's absorption of the ingested glucose and his renal threshold. It is therefore well to plan the test so as to get a sharp, distinct peak because we can then, as Dr. Benedict so well expresses it, "look for the peak as proof that the individual has been subjected to a carbohydrate tax, i. e., a strain on the organism for at least a few minutes". For this purpose 75 grams of glucose is undoubtedly better than 50.

It has hitherto been customary to take the peak specimen 60 minutes after glucose ingestion, but that choice of time must be deemed unfortunate because the very extensive literature of the subject and our own experience with different doses of glucose amply demonstrate that with rare exceptions normals and near normals reach the height of their peak nearer 30 minutes after ingesting glucose than at any other time. Of course diabetics reach their peaks later, but clinical practise is changing toward the recognition that peak specimens taken at 30 minutes are more informative than those taken at 60.

It is always advisable to dissolve the glucose in sufficient lemonade or water to avoid the irritating effects that too concentrated glucose solutions have on the mucous membrane of the stomach, and to give as much water as the subject will comfortably take, 150 cc. for 50, and 250 cc. for 75 grams of glucose should be regarded as minimal amounts.

Estimations of the urinary sugar excretion are an integral part of sugar tolerance tests and always correlated with the blood sugar findings. If the conclusions outlined by us in the 1929 Transactions of this Association on "The Advantages of Rate of Excretion over Concentration as a Clinical Criterion in Glycosuria, etc.," are followed, it will be found that the total amount of sugar excreted in the two hours following glucose ingestion

gives a clearer and truer picture than does the mere concentration of glucose in a haphazard specimen. (See postscript.)

By a process of synthesizing business exigencies and the known facts of physiology with the best clinical and insurance practises an adequate sugar tolerance test for life insurance selection may be formulated as follows:

Step 1

3 OR MORE HOURS AFTER A MEAL, OR PREFERABLY BEFORE BREAKFAST, COLLECT INITIAL BLOOD AND URINE SAMPLES AND GIVE 75 GRAMS OF GLUCOSE DISSOLVED IN 250 cc. OF WATER.

Step 2

30 MINUTES LATER COLLECT THE PEAK BLOOD AND URINE SAMPLES.

Step 3

90 MINUTES AFTER THE PEAK COLLECT THE FINAL BLOOD AND URINE SAMPLES.

(Note: Try to have subject empty bladder, measure volumes, and ascertain time of voiding prior to initial sample.)

INTERPRETING SUGAR TOLERANCE TESTS

The leading authorities on diabetes agree so thoroughly on the limitations of sugar tolerance tests that only a few illustrations are needed to portray the consensus of clinical opinion on their diagnostic value. Thus Joslin writes: "Glucose and other food tolerance tests are often unreliable", and Mosenthal states: "Increase in glycemia following the ingestion of sugar *may* be of value in diagnosing diabetes in *some* cases." Wilder hedges by saying "atypical responses that are difficult to evaluate are sometimes obtained with the dextrose tolerance test", and Rabinowitch points out that "with blood sugar time curves as with other laboratory tests a variety of conditions may be responsible for similar results".

The clinician's problem differs from the medical director's because it is the clinician's duty to apply correct treatment. To do this he must definitely diagnose the underlying cause of a glycosuria while the medical director need only decide that his subject's glycosuria is the result of either an inherent incapacity to handle carbohydrates properly or to some more innocent cause like a benign anomaly or transitory aberration from normal.

If he is dealing with a case of glycosuria and ketonuria which gives a fairly typical diabetic curve, the medical director need not know whether it is diabetic or hyperthyroid, but the clinician must and is apt to lose some of his enthusiasm for sugar tolerance tests when they fail him in making such distinctions. There are other instances which justify the inference that sugar tolerance tests are sometimes more useful in insurance than in clinical practise, especially when they are properly made and correctly interpreted.

When it comes to interpreting a sugar tolerance test such as has been described, it will be found that while the majority of results are typical some of them are atypical, and also that by making allowances for certain conditions which are known to influence the test some of the atypical results become typical. Thus the following data of Sweeney show the effects of antecedent 48 hour diets on the glucose tolerances of young normals:

GLUCOSE TOLERANCE TEST RESULTS

	Fast- ing	Half Hour	One Hour	Two Hours
Exclusive Carbohydrate Diet	84	118	113	96
" Protein Diet	69	143	167	145
" Fat Diet	83	170	206	173
Starvation	67	145	188	184

If we assume that carbohydrates stimulate the production of insulin, the moderate transient hyperglycemia which characterizes the normal response to glucose ingestion differs from the marked and prolonged hyperglycemia of diabetes only because normals have sufficient insulin for active glycogenesis and diabetics do not have enough to store glucose as glycogen. Sweeney therefore

lays the lower results of preliminary carbohydrate feeding to prompt insulin activation and the higher results of starvation and fat feeding to their tendencies to slow up and impede the stimulation of insulin secretion. He therefore suggests that some of the atypical responses to sugar tolerance tests are due to the influences of antecedent diets.

Anything which interferes with the absorption or digestion of the ingested glucose will also influence the results of a sugar tolerance test. Thus if glucose be taken at a time when the stomach contains undigested food, especially fatty food, absorption may be impeded and tend to prolong the curve and delay its peak. It is also well known that nausea and other indigestions are apt similarly to affect the test, and that is why we try to give the glucose on an empty stomach in plenty of cold lemonade or water.

Some people succeed in surreptitiously relieving themselves of the ingested glucose. Such a possibility is, of course, much greater in single blood sugar tests, but it will be proper to view low flat curves with suspicion. When subjects are not under control, many other dodges such as diuresis, diet, sauer kraut juice, liver extracts, insulin, etc., are also resorted to by people who try to influence the results of sugar tolerance tests. Of these, it may be said that liver extracts are not very efficient, sauer kraut juice does not affect Benedict's copper test, correct timing of insulin is more or less of a gamble, urinary non protein nitrogen, urea and acetone tests often give a clue to starvation, and the initial and final urines may suggest diuresis. Thus, the gravity of the initial urine passed by a recent case was 1,003, and that of the final 1,016 after the subject drank more than 250 cc. of water with his glucose.

Since sugar begins to disappear from the blood the moment it leaves the body, glycolysis accounts for many irregularities that give atypical appearances to curves. It is, therefore, better to prevent glycolysis with an efficient preservative (see postscript) whenever it is impracticable to test each sample instantly on collection.

It is also well known that like our urinary sugar tests the blood sugar tests are not specific for glucose and that in some cases other substances than glucose contribute to abnormally high values and atypical curves. While there is no present remedy for such a situation, it may be suspected when there are unusual discrepancies between the results of such different methods as, for instance, copper, iron and picric acid, and it is well to keep all of the above mentioned possibilities in mind when trying to interpret puzzling curves.

When the conditions outlined above are taken into consideration it will be found that although far from ideal, the sugar tolerance test is a very useful tool in the hands of a medical director who knows how to use it. Although it sometimes draws curves whose meanings are obscure to even the skilled and experienced, the majority of cases yield curves which portray conditions so clearly that anyone familiar with certain features of the mechanics of carbohydrate utilization can correctly interpret them.

Thus the normal response to the previously described 75 gram glucose tolerance test is an initial or fasting blood sample having a normal or subnormal value, a peak sample about 40 to 70 milligrams higher and a final (two hour) sample whose value is within 20% of the initial. With this curve goes a normal urinary excretion. While cases with abnormally high initial values are apt to give atypical curves, no departure from the above depicted condition should be regarded as normal even though appearances indicate a perfectly benign condition.

The deviation from the normal which we most frequently meet in insurance practise is a similar, often flatter, curve associated with glycosuria. These cases have a low renal threshold for sugar and are somewhat inaptly called renal diabetics, the similarity of the initial and final values with a low peak and higher urinary excretion indicating unusual permeability of the kidneys for glucose.

Some authorities regard renal glycosuria as a harmless condition because no perceptible effects on the health of many of

the cases have been noted after years of observation. It is known, however, that some of them later develop diabetes, and until a longer and larger life insurance experience is available, it would be fair to class them all as pre-diabetics.

Like the normal, the hyperglycemias of renal and alimentary glycosurias are limited to two hours, but they are easily distinguishable from one another by the sharper and higher peak of alimentary glycosuria which indicates a normal or higher than normal renal threshold. They are also distinguishable by the characters of their respective glycosurias. Thus, normals do not have glycosuria. Renal glycosurias show more or less glucose in all specimens because they have a low renal threshold and their excretion of glucose is also greater than the alimentary cases which have a higher threshold and show glycosuria only after a carbohydrate tax.

It seems reasonable to regard an isolated finding of glucose as an alimentary glycosuria without insurance significance, but when the tendency to glycosuria after a carbohydrate tax is a persistent one it means that the ability of the subject to handle carbohydrates is limited and from the standpoint of life insurance selection such a case cannot reasonably be regarded otherwise than as an early or pre-diabetic.

Mental and emotional upsets, strains and exposure sometimes cause glycosurias which give slightly atypical curves that are easily distinguishable from diabetic curves by the shortness of their plateaux, although they sometimes exhibit what McLean has called "lag". Some cases show high initial values and may excrete less glucose after ingestion than before.

People who are suffering from infections, digestive or other kinds of disease often exhibit glycosuria. Like the endocrine cases, they may give almost any sort of a curve, and some of them may be easily mistaken for diabetes. As favorable action on such cases will naturally be deferred, they are apt to be more of a problem in clinical than in insurance practise.

As distinguished from other types of glycosuria the typical diabetic curve starts with a normal or abnormally high initial sample

and ends with a final (two hour) sample whose value is more than 20% higher than that of the initial sample. In other words, the diabetic curve takes longer than the curves of other glycosurias to return to the initial level because the diabetic cannot activate sufficient insulin to store the ingested glucose. The maximum height of the diabetic curve is delayed beyond the time of taking our (30 minute) peak specimen but usually gives higher, often much higher values than we find in the peak samples of the other types of glycosuria. This, of course, is quite in order with the marked increase in sugar excretion that is also characteristic of diabetes. The renal threshold of diabetics is generally normal, but it tends to rise with the length of disease and the age of the patient; and it is worth noting that diabetics usually have less glycemia and excrete less sugar around midday than at other times.

While the differentiation of diabetes from other glycosurias is simple enough when the sugar tolerance tests show typical results, there are endocrine and other disturbances which seem to affect carbohydrate metabolism much the same as diabetes. In such instances sugar tolerance tests give obscure and inconclusive results which clinicians try to clear up with basal metabolism tests and respiratory quotient curves, etc. In insurance work ketone and cholesterol determinations will sometimes prove helpful because diabetics are so prone to acidosis and lipemia.

There is a type of diabetes of peculiar significance to life insurance selection which is sometimes called occult diabetes. It is characterized by marked hyperglycemia with little or no glucose excretion. They are apt to get on our books because there is no finding or history of sugar in urine. The literature does not tell much about them, but the cases I have seen have generally had some complicating condition like nephritis which apparently raised the renal threshold for glucose. A single blood sugar test taken at almost any time will suffice to unmask the condition. Thus, it is not among diabetes suspects but among other kinds of doubtful cases that single blood sugar determinations may be valuable in life insurance selection.

Doubtful results of a sugar tolerance test will naturally be correlated in the medical director's mind with other features of the case, such as obesity, evidences of arteriosclerosis, history of previous illness, family history, amount of insurance, etc. No discussion of the interpretation of sugar tolerance tests would be complete without reference to the sensitiveness of the procedure, because unless tolerance tests are adequately planned and properly performed, old-fashioned urinary excretion tests with any kind of carbohydrate are probably safer.

EXPERIMENTAL

In the February, 1931, issue of the *Annals of Internal Medicine* Rabinowitch of Montreal tells why he applies Allen's paradoxical law to differentiate the glycosurias of diabetes and hyperthyroidism, and how he applies it by giving "diets of constant composition with respect to protein and fat, increasing the amounts of carbohydrate daily by the administration of glucose in small amounts at frequent intervals". According to his illustrative table, he gives 10 grams of glucose every hour for 10 hours one day, 20 grams similarly the next two days, and 30 grams on the 10 succeeding days.

While such a procedure is, of course, hopeless for insurance work, the chances that it will distinguish diabetic from other types of glycosuria more specifically than our customary tolerance tests are very intriguing when related to phenomena which are well known to follow the ingestion of more than one dose of glucose.

Basing his paradoxical law on animal experiments Allen gives it as follows: "Limits of tolerance in non-diabetic animals are all apparent, not real. There is no real limit of the power of utilizing sugar except death. The paradoxical law of dextrose distinguishes sharply between diabetic and every type of non-diabetic animal. Limits of tolerance in diabetic animals are real and not apparent. Just the opposite of the paradoxical law." Allen was the first to suggest the clinical value of his law, and many independent observers, by correlative experiments on human beings, have established that normals react to a second dose

of glucose with either hypoglycemia or negligible blood sugar changes but not with hyperglycemia as diabetics do.

The underlying physiology has been satisfactorily explained by McLean and de Wasselew and well stated by Foster in summarizing his own experiments, "We interpret this fact as meaning that the first dose of glucose stimulates the insulin-glycogen mechanism to such activity that the normal organism is then able to deal with any amount of glucose without becoming hyperglycemic".

If these facts can be used to derive more specific information than our present methods, it is evident that they will also improve insurance practise if they can be made to furnish a sugar tolerance test which will give better, and more definite information, which will take less time to complete, which can be applied at any convenient time regardless of previously ingested food and which will detect insulin or any other means a subject may try to influence results.

With a view to testing out these possibilities we have formulated a procedure and carry it out according to the following directions:

THE PRUDENTIAL LABORATORY

Directions for Sugar Tolerance Test

This package contains

- 2 envelopes holding 50 grams of glucose;
- 2 longer bottles with preservative for urine samples, labels I and F.
- 3 shorter bottles with preservative and anticoagulant for blood samples, labels I, P and F
- 1 lancet.

To prepare glucose

Dissolve entire content of each envelop in 150 to 200 cc. warm water, add orange and lemon juice to flavor and cool.

To collect blood

Sterilize a finger tip and puncture with sterilized lancet. Let blood drop into shorter bottle until it is one-third to one-half full. Twirl bottle vigorously so as to bring the blood in contact with anticoagulant, and stopper tightly. By raising and forcibly lowering the arm, blood may be made to flow more freely from the finger puncture. Do not milk or press the finger tip.

Directions

If possible, make the test before breakfast, after the night fast; otherwise, with the stomach as empty as possible (i. e., three to four hours after eating). Proceed then as follows:

I Collect blood and urine (i. e., completely empty bladder); give 50 grams glucose, and NOTE TIME on memoranda below;

F Thirty minutes later give 50 grams glucose and collect blood as nearly at the same time as possible. NOTE TIME on memoranda below;

P Thirty minutes later collect blood and urine (i. e., completely empty bladder, so as to measure the volume secreted during the hour). NOTE TIME on memoranda below;

Be sure you have used bottles as labeled. Pack samples securely in box, using cotton or paper if necessary, and mail at once with memoranda.

PRINTED IN U. S. A.

33036

THE PRUDENTIAL LABORATORY

Sugar Tolerance Test Memoranda

Date.....

Name.....

Address.....

Collected by Dr.....

Address.....

Blood Samples	Time	Urine Samples	Time of Last Voiding?
Initial.....		Initial-Time.....	Volume.....
Peak.....		Final-Time.....	Volume.....
Final.....			

To accord with theory the following criteria were, a priori, adopted to interpret results of the test, and it will be noted that the interpretation of unusual values and lag effects are left to further experience:

CRITERIA

Normal response	Final sample less than or only slightly higher than peak and excretion less than 100 milligrams.
Renal glycosuria	Lower flat blood sugar curve with higher excretion.
Alimentary glycosuria	Sharp distinct peaks with lower or only slightly higher final values and excretion over 100 milligrams.
Diabetes	Final values 10 or more milligrams higher than peak and excretion over 100 milligrams.

The data which follow represent our experience to July 1, 1931, with volunteers from our office who were taken to represent normals, and diabetic patients of Dr. Asher Yaguda of Newark, who was kind enough to share with me some of the samples taken in the course of his routine tests which were made on venous blood obtained in a fasting condition.

Subject	Age	BLOOD			URINE	
		Milligrams per 100 cc.			Milligrams per hour	
		Initial	Peak	Final	Initial	Final
1 - PR	35	103	168	147	22	22
2 - PW	41	103	167	160	22	22
3 - RL	23	100	163	155	20	27
4 - MC	29	105	168	150	0	12
5 - HS	26	92	116	116	30	47
6 - CM	50	107	170	160	17	27
7 - LSm	28	123	163	160	17	55
8 - LS	23	117	140	135	16	48
9 - ES	39	120	200	187	21	55
10 - FS	37	85	150	135	42	44
11 - JH	44	106	147	131	36	20
12 - AK	24	113	163	150	70	18
13 - WK	18	107	155	137	27	17
14 - KW	....	102	160	122	1	24
15 - RL	21	102	193	160	18	23
16 - FG	35	98	135	137	....	47
17 - WP	40	105	153	155	37	40

Subject	Age	BLOOD			URINE	
		Milligrams per 100 cc.			Milligrams per hour	
		Initial	Peak	Final	Initial	Final
18 - FE	32	108	142	143	15	15
19 - DB	18	105	173	178	50	48
20 - JM	19	95	155	157	1	24
21 - LeS	21	108	145	148	20	24
22 - IR	22	100	152	160	24	30
23 - UV	22	108	145	152	1	30
24 - EP	19	100	143	152	9	28
25 - JO	24	120	153	160	33	32
26 - OS	----	107	134	140	24	28
27 - LS	43	130	172	163	20	60
28 - KK	----	125	157	157	5	2
29 - AS	47	133	190	177	28	78
30 - ME	21	133	184	180	----	30
31 - MA	29	113	167	167	----	50
32 - NR	20	106	172	163	48	24
33 - RK	18	120	170	155	33	35
34 - NA	49	103	163	165	16	7
35 - MN	25	108	158	158	2	2
36 - FP	57	122	170	178	40	60
37 - AA	19	117	155	143	54	15
38 - WS	56	117	235	215	20	96
39 - FC	55	103	220	217	54	64
40 - AY	----	107	127	137	----	30
41 - EC	23	115	173	157	0	211
42 - FH	----	112	167	163	60	120
43 - MS	51	100	197	177	74	170
44 - WC	40	108	168	170	84	137
45 - JE	61	87	183	205	64	170
46 - CV	64	105	218	236	146	265
47 - AH	----	172	274	345	300	620
48 - AM	----	122	175	182	123	365
49 - WK	61	234	300	350	1100	5500
50 - WC	64	128	220	230	295	570
51 - NW	----	134	204	224	10	169
52 - BA	----	97	198	254	23	553
53 - KB	----	200	286	334	644	4560
54 - MC	----	126	178	188	16	229
55 - AD	40	185	260	284	100	225
56 - SW	----	208	256	268	100	1100
57 - HR	26	129	145	250	18	180

Subject	Age	BLOOD			URINE	
		Milligrams per 100 cc.			Milligrams per hour	
		Initial	Peak	Final	Initial	Final
58 - PG	61	175	186	240	360	3800
59 - LB	52	97	188	200	72	185
60 - HG	21	240	376	440	400	1064
61 - MK	63	142	194	274	....	....
62 - DR	36	112	178	198	....	2410
63 - Ab	....	92	216	236	....	770
64 - ME	56	157	230	236	....	....
65 - YA	....	92	216	244	....	....

- 1 - 38 - Normals, taken at random times regardless of prior food.
 39 - 40 - Non-diabetic patients, taken at random times regardless of prior food.
 41 - 44 - Alimentary glycosuria, taken at random times regardless of prior food.
 45 - 50 - Diabetics, taken at random times regardless of prior food.
 51 - 57 - Diabetics, initial fasting specimen.
 58 - 65 - Diabetics taking insulin, initial fasting specimen.

The above data may be summarized by the following medians:

		BLOOD			URINE	
		Initial	Peak	Final	Initial	Final
Cases	- 1 - 40	107	162	156	22	28
"	- 41 - 44	110	170	166	67	154
"	- 45 - 65	128	218	250	128	560

If we recall that the present sugar tolerance tests, with all their shortcomings, represent the experience of thousands of cases, it is apparent that the material we have been able to study by the new plan is much too scanty to warrant any other conclusion than that the subjects so far tested gave results which fit our theory. The new procedure, therefore, looks very promising and merits further study with an eye on the possibility of working out a practical test for life insurance purposes which may eventually require only two blood samples, detect attempts to influence results, and take only an hour to complete.

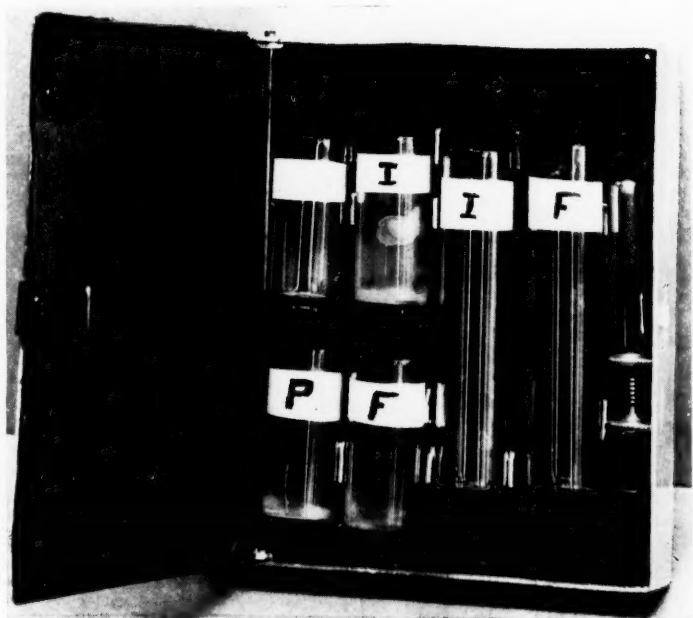
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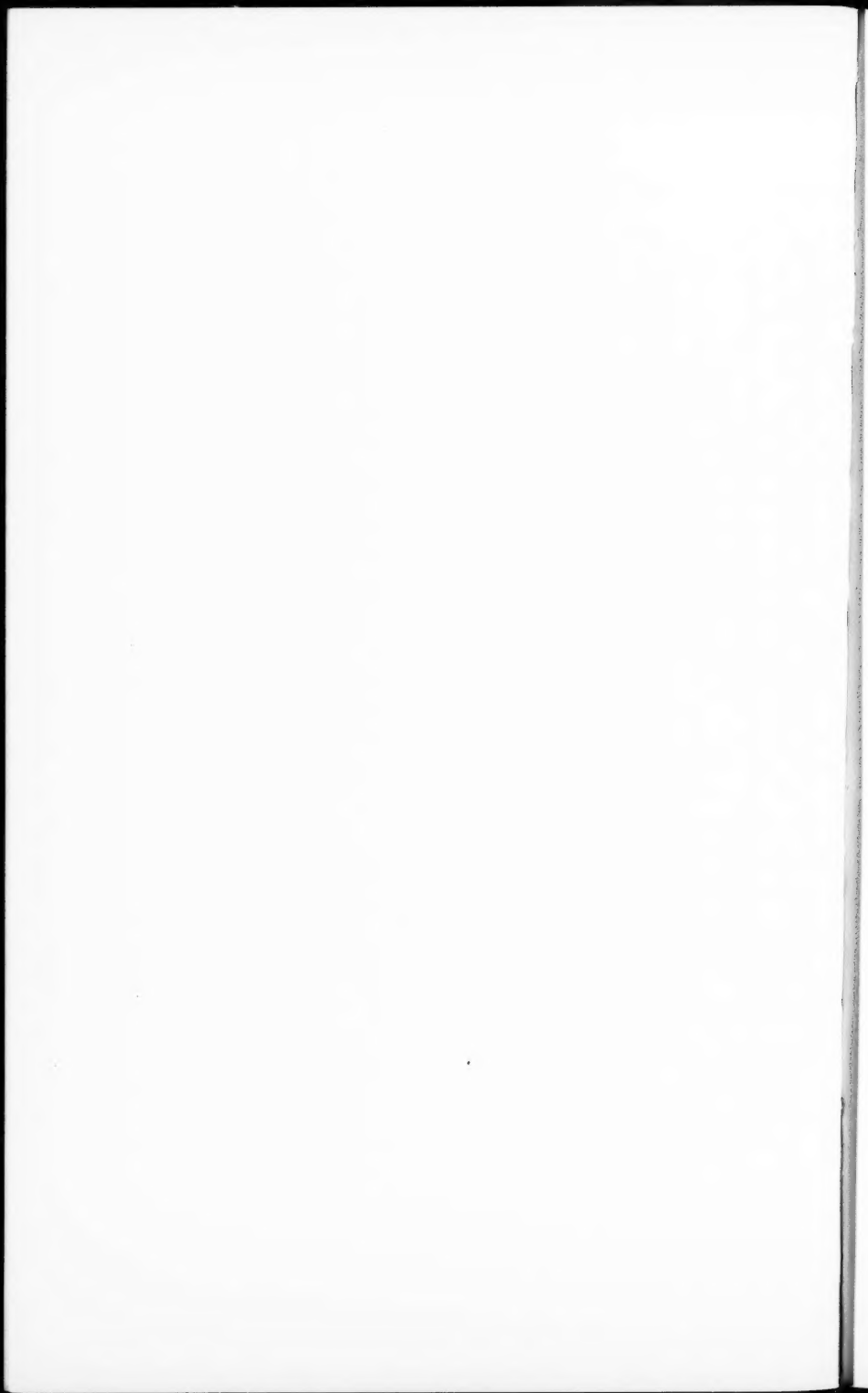
The advantages of home office over field laboratory tests are so many and so well known that they need not be repeated, but we found it impossible until last year to handle satisfactorily blood sugar tolerance samples collected in the field. Since then, we have experienced no difficulties at all in getting in good condition from the field enough blood for duplicate sugar determinations.

We mail an aluminum box containing a lancet and five small vials: two longer ones for urine and three shorter ones (1 1/4 inches long and 1/2 inch diameter) for blood. The blood vials are scratchmarked at a level indicating the minimum amount desired (0.3 - 0.5 cc.) which suffices for duplicate determinations. After cleansing, the blood vials are rinsed with a 5% solution of thymol in chlorbenzene and stoppered with rubber after adding one drop of a saturated solution of potassium fluoride. These preserve the blood and prevent glucolysis and coagulation. The examiner then collects the blood according to the directions given in describing our experimental sugar tolerance test. So far, no difficulties have been encountered; in fact, a cc. of blood is easily obtainable when desired.

To determine the urinary excretion rate, multiply the urinary volume by the sugar concentration and divide the product by the time interval between the two voidings. In doing this it is advisable to urge the subject to completely empty the bladder at each voiding.

We have found the phenylhydrazine test to be the most practicable method of differentiating glucose from all the other sugars and reducing substances which urine may contain, especially when concentrations are small. Some years ago we studied the various technics found in the literature and adopted Kowarsky's method, which is carried out by adding 3 to 5 cc. of urine to a mixture of 5 drops of phenylhydrazine, 10 drops of glacial acetic acid and 1 cc. saturated salt solution. The test is boiled until the curdled mass which forms has dissolved and is then allowed to cool. Since the urine may contain an inhibiting substance, we have succeeded in increasing the delicacy of the





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test by performing Kowarsky's method on the filtrate obtained by adding 0.5 cc. each of 10% zinc sulfate and 0.5N sodium hydroxide to the urine and filtering. This clarification step is well worth while because the crystals are larger and more beautiful and gives the technician more assurance in difficult borderline specimens.

The concentrations of the sugar in blood and urine in these sugar tolerance tests have been determined by the methods in use in the Prudential Laboratory. These have been previously reported to this Association. For urine, we use the dinitro salicylic acid reagent of J. B. Sumner so modified as to adapt this method to Electro-Scopometry. 1/5 cc. sample of urine is used. For blood, 1/10 cc. of the sample is deproteinized with an excess of hydroferricyanic acid. When the protein-free filtrate is made slightly alkaline and heated, the blood sugar reduces ferricyanide to ferrocyanide, which, in turn, is precipitated by ammoniacal silver, and the Scopometer reading of this turbidity gives the concentration of glucose in the sample.

DR. MOSENTHAL—The paper of Exton and Rose covers this field so thoroughly and accurately that it is impossible to take up all the points suggested by them and discuss them in detail. I wish to confine myself to certain phases of the subject:

1. The best available method for determining the advisability of issuing life insurance to persons who have exhibited glycosuria.
2. Renal glycosuria (renal diabetes).
3. Alimentary glycosuria.
4. The proposed sugar tolerance test of Exton and Rose.

NEED FOR A CARBOHYDRATE TOLERANCE TEST

There are many persons in whom the significance of a glycosuria cannot be determined without a carbohydrate tolerance test. Much time and energy is spent in carrying out casual urinary and blood sugar tests without arriving at any definite conclusion. It is advisable, I believe, in both clinical and life

insurance medicine, in these border-line cases to resort immediately to the so-called sugar tolerance, so that the diagnostic field may be as accurately defined as possible with the least expenditure of energy and money.

THE TEST SUBSTANCE

As Exton and Rose have shown there are many starches and sugars in various amounts advocated as having distinct advantages. Thus far there is only one substance that has received sufficient attention to make us certain of the result in normal persons and that is glucose. Furthermore, there is only an adequate experience to judge of normal response when this material is taken in 100 gram doses in the fasting state. There may be other test substances, other doses and other conditions than fasting, that may be advantageous for the performance of sugar tolerance tests, but the hundreds of controls, in different laboratories, in persons of various ages, in individuals with divers dietetic habits and at different times of the year, are not available with any other means. Consequently for the present 100 grams of glucose taken in the fasting state is the ideal load for the performance of sugar tolerance tests.

CRITERIA FOR THE EVALUATION OF THE SUGAR TOLERANCE TEST

A blood sugar of 120 mg. or less per 100 c.c. at the end of two hours after the taking of glucose is generally accepted as indicating that diabetes mellitus does not exist and that the sugar tolerance is normal. This is my experience and as far as I have been able to determine also that of others. The question of whether the time for this period should be extended to 2½ or even 3 hours has come up. There are many observations at hand to indicate that this is feasible, but final judgement on this matter must be postponed until further experience is gathered. When only one blood sugar is taken the one 2 hours after the ingestion of glucose is the preferable one.

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The fasting blood sugar, is, except for the determination taken 2 hours after the ingestion of glucose, the most significant element in the sugar tolerance test, for two reasons:

1. It furnishes a control determination that enables the interpreter of the sugar tolerance test to form an estimate of the accuracy of the chemical technique.

2. When the fasting blood sugar is greater than 120 mg. per 100 c.c. a diminished sugar tolerance exists. Thus far I have not carried through a blood sugar curve in which this did not hold true. The fasting blood sugar represents the most favorable period in the daily routine for the lowering of the glucose in the circulation and if it is not within normal bounds at this time there is a definite indication of an impaired carbohydrate metabolism. The converse, that every normal fasting blood sugar negates the presence of diabetes mellitus is known to be incorrect.

The peak of the blood sugar curve as the essayists have shown occurs anywhere from 20 to 60 minutes after the ingestion of glucose. When the sugar tolerance is diminished its appearance is delayed. The height of the blood sugar apparently is not of diagnostic value in determining the existence of diabetes mellitus. The peak is elevated above the usual amount of 160 or 170 in every instance of diabetes, but those in whom the blood sugar, in spite of the height of the curve, returns to normal within 2 hours do not have a diminished carbohydrate tolerance. Maclean, the English author, recognized this some time ago and all the facts developed since then have proved his contention to be valid.

The examination of the urine during a sugar tolerance test may be interesting, but yields no data that are of value in determining the availability of a life insurance risk. A glycosuria may prove to be indicative of an alimentary or a renal glycosuria. If an applicant is to be refused on these grounds there is no object in carrying out a sugar tolerance test, as the finding of glucose in the urine in a casual specimen would be sufficient evidence of the existence of one of these anomalies without further investigation.

INTERPRETATION OF SUGAR TOLERANCE TESTS

The authors have accused some of us, that follow the clinical cult, as being ambiguous in our statements in regard to interpreting the significance of this test. I believe this can be very strictly defined: When an adult has a fasting blood sugar of 120 mg. per 100 c.c. or less and a similar blood sugar 2 hours after the ingestion of 100 grams of glucose, he, or she, has no diabetes mellitus. On the other hand, there are many cases that have prolonged sugar curves that have no diabetes and never will have it. These subjects do not receive their due because there is no known means of differentiating them from true diabetes. However, we have advanced very far from the time 15 years ago when one of the leading authorities told me emphatically that there was no such condition as renal glycosuria and that every case of glycosuria was certainly an instance of diabetes mellitus. More than one third of the cases I have examined during the last ten years exhibited a normal tolerance to 100 grams of glucose.

RENAL GLYCOSURIA

The term renal glycosuria has largely replaced the name renal diabetes because it is believed that the occurrence of glycosuria in the two conditions is brought about by functional disturbances that bear no relation to each other though the two may coexist. From the work of A. N. Richards and his associates it is now known that the glomerular urine is formed by a process akin to filtration and that this glomerular urine contains sugar in a concentration equivalent to that in the blood. As the urine passes from the glomeruli through the tubules of the kidney water, glucose and other substances are absorbed and, as in the case of sugar, may be completely removed from the urine, in the clinical sense at least. In the average human being glycosuria does not become manifest until the blood sugar reaches a level of 170 mg. per 100 c.c. There are a great many exceptions to this rule. The blood sugar level at which glycosuria appears is often higher than 170 and it is frequently lower. A renal

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glycosuria, that is a glycosuria which appears when the blood sugar is less than 170 mg. per 100 c.c., is best detected by obtaining the urine and blood specimens at frequent intervals after the ingestion of glucose. We have found that a series of three such sets of specimens taken 20, 40 and 60 minutes after the glucose administration is the most satisfactory. The so-called renal threshold must be determined on the upstroke of the blood sugar curve since when glycosuria has once become established the level of blood sugar at which glycosuria is prevented is lowered a great deal. The "threshold" to glucose on the down curve is therefore a good deal lower than that characteristic of the individual. The determination of the presence or absence of a renal glycosuria would seem of more importance to the clinician than to the life insurance examiner. I would like to repeat that renal glycosuria is a harmless anomaly on the part of the secretory activity of the kidney while diabetes mellitus is a diminished ability of the organism to utilize glucose and that the conditions are not related, do not develop one from the other, though, in occasional instances, they may coexist.

ALIMENTARY GLYCOSURIA

This form of glycosuria is the result of a high peak in the blood sugar curve. This, as has been mentioned, is not significant of a diminished sugar tolerance provided the blood sugar returns to 120 mg. or less within two hours after the taking of glucose.

THE PROPOSED SUGAR TOLERANCE TEST OF EXTON AND ROSE

The scheme which the authors offer for the shortening of the duration of the sugar tolerance test by taking advantage of Allen's paradoxical law is very ingenious and suggestive. The determination of the value of this theory will have to rest on the making of further observations in this work that has begun so energetically and scientifically. I am sure that we all wish Exton and Rose all success in their efforts so that they may

have the great satisfaction of preparing for us a more adequate and available test for carbohydrate tolerance than the one we have at present. The experimental results which they have presented would point to the possibility of a shorter procedure which will be so decisive that it will merit universal adoption.

DR. FOLIN—I have read with great interest Drs. Exton and Rose's comprehensive discussion of how best to handle the diabetes problem in its relation to examinations for life insurance. I was certainly astonished to learn from their paper how widely different are the practises in different insurance companies, and it must be altogether helpful and good to devote a little time each year to a consideration of this problem, so long as the different insurance laboratories are still feeling their way more or less independently, and evidently more or less in fear of adopting a wrong procedure or policy. It was only last June that I received a letter from a life insurance company in the Middle West asking, by advice of local physicians, whether it was not taking a dangerous and legally indefensible risk to administer 100 grams of glucose to applicants suspected of being diabetic. Yet in its essence this problem, as Drs. Exton and Rose point out, is not very complicated. Almost any laboratory could surely learn some one method for the determination of sugar in blood and urine, and could then supply data which would show with a very high degree of certainty whether a given person is or is not diabetic.

On the whole, the situation with respect to this particular problem must therefore be considered as fairly satisfactory.

Yet in the paper before us are raised many detailed points and questions; questions concerning which there is plenty of room for differences of opinion, and it would require a symposium of several hours to adequately represent what might be said of them. I will take the liberty to briefly express my own opinions on two or three of these points.

First, as to the time to be chosen for the test meal. It should make no essential difference whether the test meal is given before

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breakfast or in the middle of the forenoon, because an average breakfast, including rolls or toast, would tend to raise the effect of the test meal with the diabetic, and would have the reverse effect on the normal.

Second, renal glycosuria should not be regarded as a pre-diabetic condition for insurance purposes. While such persons, like others, might become diabetics, they would then have so much more sugar in the urine than other diabetics of the same degree, that any errors made concerning them would always be against them. Intrinsically, there is I think no connection whatever between renal glycosuria and diabetes.

Third, the peak value of the blood sugar obtained 20 to 30 minutes after a test meal is very variable and has no demonstrable importance. If one has plenty of time for an extra determination it is rather interesting and instructive to see that initial peak, but for diagnostic purposes I should say that it is certainly the least important. The supposed value of the peak as a sign that the given sugar actually has been absorbed is, I think, largely academic, because the absence of the peak does not prove that the given sugar has not been absorbed. Also I believe that a given dose of sugar is so nearly always absorbed that the exceptions can be ignored.

There remains much important work still to be done. In response to every dependable simplification of the tolerance tests for diabetes there will come a large increase in the number of persons who will get the benefit of such examinations. Therefore there can be and should be no let up in the research until we have found approximately the easiest possible procedure, the procedure with the fewest and simplest moves, by which one can come to a decision about the presence or absence of diabetes.

While it is cheering to note the confident, optimistic tone pervading the text of Drs. Exton and Rose's paper, the actual analytical results presented seem to me to tell a somewhat different story. So far as I can see, the 195 blood sugar determinations made on the 65 persons examined have contributed surprisingly little information. Although three blood sugar

determinations have been made in connection with each sugar tolerance test, I certainly should not be able to pick out all the non-diabetic bloods from the tabulated figures, and I wonder whether any one else could. We can not take time to examine the table in any detail, and I ask you only to compare the blood sugar figures for Subjects No. 45 and No. 38. No. 45 is supposed to be diabetic, and No. 38 non-diabetic, yet in each of the three blood analyses, No. 38 has yielded higher sugar values than those given by No. 45.

There clearly must be something not quite right in the experimental conditions to give such results. In this connection it must be pointed out that the new feature in the work as presented is the fact that the sugar has been given in two instalments, instead of being given as a single dose. There is an element of possible merit in this scheme, since it is well established that under the right conditions a second dose of sugar normally should produce very little rise in the level of the blood sugar. Yet I believe that this new condition must be largely responsible for the peculiar blood sugar values recorded in the paper.

It seems to me fairly certain that in trying to make use of this idea, Drs. Exton and Rose have been led astray by a wish to cut down the total experimental period to one hour. The confusing picture of blood sugar levels recorded in their tabulated figures is due, in all probability, to the fact that the second dose of glucose is given too soon—only half an hour after the first. To secure the characteristic normal effects of a second dose of sugar, the intervening waiting period can scarcely be less than one hour. It would be highly desirable, of course, if the total time of a reliable sugar tolerance test could be cut down to one hour, but it is rather improbable that this can be accomplished except on the basis of a single and distinctly small dose of sugar. And it is by no means certain that it can be accomplished under any conditions.

As against the miscellaneous, indecisive character of the figures for the blood sugar we have the clear cut values for the urinary

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sugar in the last column of the table. If you will glance at these figures for just a moment you will see how readily these separate themselves into the diabetic and the normal, leaving us in doubt only for the small number of intermediate values representing so called alimentary glycosuria. If it were not known from past experience that serious errors have been made in trying to make a decision on the basis of urine analysis alone, one might be tempted to cite this table of figures as showing that blood analysis might as well be omitted in connection with tolerance tests for diabetes.

In closing, I wish to return for just a moment to the possibility of devising a reliable sugar tolerance test limited to a waiting period of one hour. If I were to seek such a quick tolerance test I should try to use not more than 40 grams of cane sugar and would then depend entirely on the level of blood sugar found at the end of one hour—supplementing this, of course, with a sugar determination on the urine passed at the end of that period.

In making this suggestion, I am not forgetting that my colleagues, Benedict and Blatherwick, at least tentatively, have taken a stand against the use of cane sugar. But in my opinion, it is only a question of time until cane sugar will be the only sugar used for routine sugar tolerance tests. Every one knows that the diabetic's response to cane sugar is sugar in the urine and corresponding to such excretion there will be high levels in the blood.

DR. BLATHERWICK—I did not come here with the idea of contributing anything to this discussion, but I am very glad to have a chance to say a few words. I might say that I had a very pleasant visit yesterday with Dr. Folin in my laboratory and we had a discussion about the use of cane sugar in connection with the carbohydrate tolerance test. I was one who reported last year that certain apparently normal individuals when given a dose of 50 grams of cane sugar did not respond with any appreciable increase in the blood glucose, and on the basis

of those findings in the case of three individuals out of some thirty I did not feel like recommending the use of cane sugar in this connection, but I do feel that it would be a perfectly true statement to make that no diabetic when given cane sugar would not respond with an increase in urine sugar. That is perfectly true. So I am entirely open in my mind on that question. Of course, there are other matters which Dr. Folin has pointed out in the use of cane sugar, its availability and purity and so forth.

I must say that I read the paper of Drs. Exton and Rose with a great deal of interest. My feeling is that Dr. Exton and Dr. Rose do not present this paper as a recommendation for its adoption, but reported it merely as an experimental finding, as something to be worked on to see if they can't get a test which will cut down the time of the sugar tolerance test.

It occurs to me that they apparently place a good deal of stress on the amount of sugar excreted in the urine, that is, in the differentiation between the alimentary glycosurias and the diabetics. I am wondering, Dr. Exton, how satisfactorily you can get those collections of the urine specimens in the field? What success have you had in getting the correct volumes at correct times, and what assurance have you that the bladder is completely emptied at the beginning or the end of a given period? It seems to me that these would be practical points that would have to be considered.

I might say that at the Metropolitan we, at the present time, favor the use of 50 grams of glucose, given either in the fasting condition or at least two and a half hours after a meal, and we are collecting three blood specimens, the initial sample, one at 30 minutes and one 2 hours after giving the glucose. We feel that 50 grams of glucose is sufficient for the purpose of the test in picking up a diabetic condition.

Regarding cases which given an atypical blood sugar curve after glucose, cases which are not diabetic, it would seem to me that such atypical curves certainly indicate that something is wrong somewhere in the metabolism and should be thrown out anyway in insurance work. I think that is all.

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DR. BLAKELY—Without attempting to discuss Dr. Exton's interesting paper, I wish to describe briefly the method of selection in glycosuria cases which we have followed in the New England Mutual for the past eight years. The results of actual experience have value and to us this test has proved satisfactory.

In the Summer of 1923, realizing that various urinary tests had proved unreliable and unsatisfactory in the experience of many companies, our own included, we decided to rely in the future on blood-sugar tolerance tests in all cases in which glycosuria is found on examination or has been found in the past.

We wished to make our test as simple as would be consistent with dependability. We planned to reduce to a minimum the time which the applicant must give for the test. It was essential, also, to keep the expense within reasonable limits. The technique adopted requires the applicant to take 100 grams of dextrose, dissolved in 250 c.c. of water well flavored with lemon juice. He is then free to go about his business but must return in exactly two hours, when the blood-sugar is determined, preferably by the Folin-Wu method. By using freshly-drawn blood we avoid preservatives. We have not used the micro-method. For applicants who come to the Home Office, the test is made in our own laboratory, elsewhere it is made "by some specialist whose report will be acceptable to our Chief Examiner" in the agency which submits the application. Prior to a year ago, the upper limit of blood-sugar for acceptability was 120 mgms. per 100 c.c. of blood. During the past year we have been willing to issue moderate amounts to applicants—otherwise exceptionally good—who show blood-sugar up to 140 mgms.

Not only have we found the technical results of the test satisfactory, but we have been happily surprised by the ease with which the work has been done. Now and then an individual applicant has refused to submit to the test. There have been no unpleasant "accidents" in connection with the carrying out of the necessary details. In a little over eight years this test has been applied to individuals ranging in age from 11 to 64. We have accepted 1,337, or 72.54% and declined

506, or 27.46%. Policies have actually been issued to 1,099 individuals. The mortality up to October 1, 1931, based on the American Experience Table, has been as follows:

No. of Lives	1,099	
No. of Exposures	3,976	(Av. duration 3.6 yrs.)
Expected Deaths..	45.36	
Actual Deaths	7	

or a ratio of 15.43% of actual to expected. Diabetes did not appear as the cause of death in any of the seven claims which have arisen nor is there any reason to suspect that diabetes had developed in any of the seven individuals who died. The recorded causes of death were as follows:

Angina Pectoris	Age at Death	47
Automobile Accident	" " "	30
Pneumonia	" " "	47
Alcoholism	" " "	48
Fracture of Spine (result of fall)	" " "	47
Coronary Thrombosis	" " "	50
Myocarditis	" " "	67

DR EXTON—Taking the discussions in reverse order, Dr. Blatherwick is perfectly right about the new test being purely experimental in its present stage. Its possibilities seem very intriguing to me, but we have, as some of you may have noted, carefully avoided recommending it at the present time. Next year we expect to cover the proposition much more definitely.

Dr. Blatherwick is also right about the possibility of error in reckoning urinary excretion. You will note, however, that the differences between normal and diabetic excretions are so very wide that slight inaccuracies will not mislead; but, of course, an occasional case with large prostate or other cause of retention will be met, when such a possibility should be borne in mind.

Dr. Folin's discussion needs touching on only two points. One is the lack of definition he says he finds between two particular cases, which I do not remember offhand. However, I do recall

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that one of the cases had a high number and that all of the high numbers in our data are cases which received insulin prior to or during the test. I thought this data would interest you because it is the first of its kind in the literature of diabetes and because the test showed up diabetic conditions, notwithstanding the use of insulin. I must therefore disagree with Dr. Folin regarding the cases he cites, and am free to confess that one of the advantages I am expecting of this new test is its ability to spot those who try to get insurance they have no right to by using insulin.

The only other point of Dr. Folin's discussion that needs touching on is his insinuation that there is some similarity between the new test and giving 50 grams of sugar two or three hours after a mixed carbohydrate breakfast. Of course that is wholly beside the truth, because there is not the slightest resemblance—neither in theory, practise, principle or effect.

I think Dr. Mosenthal is perfectly right in holding to 100 grams of glucose on the basis of the extensive experience with that dose, but on the basis of our own studies I am confident that 75 grams of glucose does not change matters enough to make a material difference in the results.

Dr. Mosenthal's statement that sugar tolerance tests do not require urinalysis is correct if one limits tolerance tests to the mere matter of deciding if a subject is normal or diabetic. If one wants all the information a sugar test can give, such as about renal diabetes or alimentary glycosuria or the subject's threshold, urinalysis is, of course, indispensable, and I am sure that Dr. Mosenthal will agree that such information is unobtainable without urinalysis. I am glad Dr. Mosenthal stressed the cases which do not get their due. He refers to cases which do not have diabetes although they give curves that resemble the diabetic. In our paper we have called such curves atypical, and in touching on these perhaps I can answer a question that is often asked me in a way that may serve as a satisfactory working hypothesis for some of you.

In my experience the cases which give atypical curves almost always have some primary condition, either temporary or more or less permanent, which accounts for the disturbed carbohydrate metabolism. The clinician who treats them must find out the nature of the primary condition, but in life insurance it is prudent to postpone the case until the nature of the primary condition is understood.

In conclusion, there is a point which needs to be emphasized with all the emphasis that can be put on it. It is this: Although in life insurance work sugar tolerance tests are in their infancy, it is not hard to visualize a future when sugar tolerance test records will be nearly as frequent as urinary sugar records. When this comes to pass, proposals will, as a matter of course, come to one or another of our companies with sugar tolerance records of other companies dating from previous years. The point I want to emphasize is that unless the tests made by our different companies are comparable with one another, such records will lose most of their value.

I therefore suggest that each company critically examine its own pet procedure, using the 75 gram test described in the paper as a sort of stalking horse for gauging its practicability and efficiency. In this way minor changes may be brought about which will tend to bring us into agreement with one another.

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